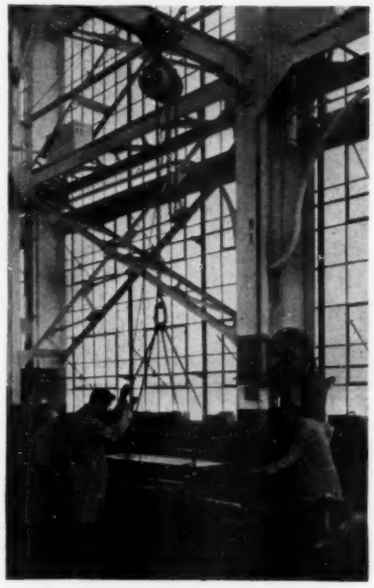
American Machinist

June 2, 1937



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Volume 81 — Number 11

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MODERNIZATION AT WORK MAKING MONEY

THERE ARE hundreds of practical suggestions for you in the detailed description of how one eminently successful manufacturer is making modernization make money right now. . . . International Business Machines Corporation. A whole issue of American Machinist is devoted to the job . . . packed full of photos and operating data, and facts about management policies, manufacturing methods, labor relations, etc. Don't miss this valuable "case study."

★

Next issue . . . . June 16

ANNUAL MODERN PLANT NUMBER

Talking Shop

Spare Part Headaches

A Texas subscriber has just sent in a letter which we are reproducing here without editorial comment. None seems necessary.

"We had occasion recently to order some repair parts from a prominent lathe manufacturer. The parts consisted of some headstock gears and bronze bushings, and the factory shipped them unwrapped and unprotected in a single box. The condition of the bushings at the end of their thousand mile journey can well be imagined—they were mutilated almost beyond repair.

"Another shipment of repair parts which gave us a large headache was from a prominent pump manufacturer, and consisted of several thousand dollars worth of spare parts for a newly installed battery of pumps. Our order called for identification of the individual parts by tags, indicating the part name and number and the serial number of the pump. Neglect of the vendor to comply with this request caused confusion upon receipt of the parts, additional work in indexing the stock and created possibility of errors in future re-ordering.

"Such experiences are not uncommon, in fact they are all too frequent.

Why is it that manufacturers who enjoy excellent reputations for their products, and who spend thousands of dollars annually advertising those products, permit such careless handling of repair part orders? It would appear that at least some of the money spent in selling their products to the purchasing agent would be better invested in keeping the good will of the men who operate and maintain the equipment.

"When the boss gives me permission to buy that new lathe which I want to put in the shop, I will not be surprised to see on the blank order sheet before me a picture of a mutilated bronze bushing. Or if he asks for my opinion on a new battery of pumps, the memory of my experience with unidentified spare parts might give me a new slant on the performance of the last installation."

Uncontrollable Dust?

When carburized balls are dumped from heating machines (rotary carburizers), the "flour" compound flies into the air almost as if it were propelled by an explosion. The flour settles all over the place, particularly on the roof trusses and any overhead piping. The slightest jar will bring

down clouds of it. Several people have worked on the problem of sucking up the dust as it billows upward during the dumping process. They have been unsuccessful so far in suggesting a suitable control. Have you any ideas?

Through the Front Door

Most of us, probably, fail utterly to appraise at their true value the effect on industrial relations of the little things. Here is an example.

The manager of a plant employing a hundred men hired a new hand a week or so ago. The candidate was young but he had worked in several other shops and looked promising.

After he had answered all the questions put to him he came back with a few of his own. One of them was, "How do I get into the shop?"

When told that he would come in through the front door, along with everybody else, from sweeper to president, he seemed surprised and decidedly pleased. His attitude was perplexing to the manager who had never thought about this point because everybody had always come in through the same door at this shop.

Obviously, in a plant employing thousands of men, it would not be practicable to have employees, executives and visitors all coming in through the front door. But there are many plants where the employees' entrance might be made much more presentable than it is, and without making the men feel that money was being wasted on frills.

Job Shop Prices

Wages, shop rent and taxes all vary rather widely in different parts of the country. But the hourly charge for work done in contract shops is amazingly uniform at about $1.50 per hour. It doesn't seem to make any difference whether the shop has only a decrepit lathe and drill press, or is fairly well equipped with machine tools. Perhaps this is why so many small shops fold up.

Worse than this, however, according to the proprietor of one of the best equipped contract shops we have seen, is the practice of getting estimates from several shops and playing one against the other. On some work men in shops so small as to have almost no overhead make ridiculously low bids, and others fight for business that is sure to prove a loss. Making money in a job shop certainly takes a high quality of management.

—*The Editors.*

Measured Daywork

What Is It?

The basic definition of measured daywork, and the other information given here, came out of a panel-type discussion at a meeting of the Production Division of the American Management Association, held in Chicago recently.

Participating in the discussion were R. H. Rositzke, of R. H. Rositzke & Associates, management consultants, New York City; Stanley Fisher, assistant to works manager, American Hard Rubber Co., Butler, New Jersey; F. J. Van Poppelen, industrial engineer, Remington Arms Co., Bridgeport, Conn.; Merritt Lum, industrial relations, Johns-Manville, New York City; Wally George, industrial engineer, American Steel Foundries, Chicago; and L. C. Morrow, editor, *Factory Management and Maintenance*, who acted as chairman.

The discussion took the form of an inquisition, Mr. Rositzke answering a barrage of questions fired at him by the other members of the panel. We are indebted to Mr. Morrow for this summary of the discussion.

MEASURED daywork is an incentive method of paying wage earners. The measured daywork rates are made up of two parts: (1) base rates, and (2) extra compensation rates.

How Base Rates Are Figured

Base rates are determined by means of job evaluation. Jobs are evaluated irrespective of wages; are completely free from the wage question to begin with. The process is merely a determination of the worth of jobs in relation to each other. Rates for these evaluated jobs are then set in accordance with company policies on prevailing community rates, labor conditions, and the like.

In evaluating jobs, the requirements are analyzed as to:
(a) SKILL (b) RESPONSIBILITY (c) MENTALITY (d) WORKING CONDITIONS (e) PHYSICAL APPLICATION.

Extra Compensation

Extra compensation rates are determined by combining weighted values for (a) quantity of production; (b) quality of production; (c) versatility of employee; (d) dependability of employee. Weighting varies with processes, companies, and industries. (For example, where quality is a prime factor in sales result, and is largely under control of the employee, quality of production might represent 50 per cent of the extra compensation rate. But where quality is not an important sales factor, or where it is only slightly under employee control, quality of production might represent only 10 per cent of the extra compensation rate.)

Job evaluation as such does not change, except when technical changes take place in the jobs.

Rates May Change

Base rates may change, in accordance with changes in prevailing community or industry rates; and in accordance with changing company rate policies.

Extra compensation rates also change. The employee's performance (as to quantity, quality, versatility, dependability) is reviewed periodically, the frequency being not less than one month, and preferably every three months. Factors that determine the frequency of review are: (1) Type of process or manufacture; (2) normal rate-change period from the point of view of employee relations. Performance for a given period determines the extra compensation for the ensuing period.

On the average the base rate represents from 75 to 85 per cent of the total measured day rate. However, practice varies. Some managements believe in keeping base rates low with the objective of having employees earn as much more as they can on their own merit. Others believe in keeping base rates high and insisting that the performance of employees be consistently high to justify them.

In the factor "quantity," in the extra-compensation rate, the usual methods of determining output standards are followed. They include the use of such devices as time and motion study, standard costs, standard times.

Because foremen have to explain fall-downs, more work devolves upon them. But since they are also given credit for improvements, there is an incentive toward alertness and the acceptance of responsibility. On the whole, highly proficient foremen and supervisors are required. Measured daywork affords a test for the capacity of supervision. For the most part the individuals live up to the capacity

requirements when given a chance to do so. There is also likely to result the focusing of attention on needed methods changes.

In some instances measured daywork has proved to be an advantage to foreman and supervisors because it is easily understood by employees. Little time has been consumed in arguing about rates that have gone in; effort is devoted toward maintaining performance on a level that will insure high measured daywork rates for employees.

In most cases measured daywork has provided a rate of pay more nearly uniform than that provided where the factor "quantity" has been the controlling element in the determination of the day's pay. The psychological effect upon the employee and upon his wife is favorable and important. Employee resistance to methods changes is reduced. So is management's hesitancy in making such changes.

Staggered Payroll Work

Use of measured daywork does not mean any less work for the payroll department. Nor does it mean any more work. It does, however, allow payroll work to be staggered. Rating revisions can be compiled during off-peak periods. The pay envelopes are delivered close to the week in which the work being paid for was done.

A portion of the employee's incentive earning is contingent upon quality performance. Should performance be below par, the employee will not obtain the expected earnings. Below-par performance averages are taken account of in the "quality" factor in revisions of the extra-compensation rate. This practice makes for good control of quality.

Under some payment plans, when an employee is taken off a job on which he has become quite skilled, and put on a new job, where he has to learn new motions, he receives less pay. Under measured daywork the employee is given opportunity between the periods of re-rating to recover standing lost by the transition. The versatility rating and lengthened re-rating periods accomplish this result.

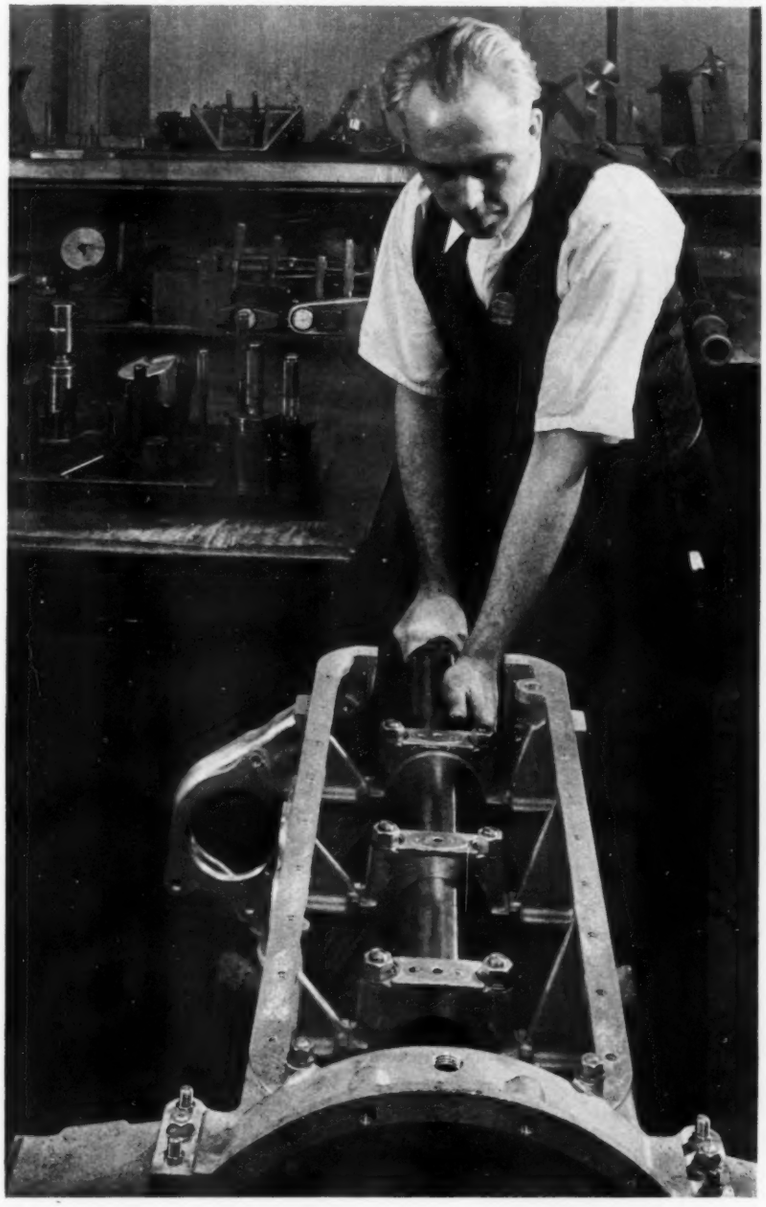
Under measured daywork a premium can be paid for versatility—contrary to procedure under a system of specialization, where the emphasis is upon quantity. This makes for protection in many ways, and enables management to keep both types of employees happy.

During depressions, when wage-earner incomes must be reduced, under measured daywork the incentives remain constant. Income reductions are made in the base rates. No more trouble should be experienced in this procedure than in the cutting of incentive or straight hourly rates—and probably not as much. Properly administered, measured daywork will avoid the accusation by employees that management is using the reduction of incentive rates as a subterfuge for cutting wages.

The cost of maintaining measured daywork is approximately the same as that for maintaining the average wage incentive plan.

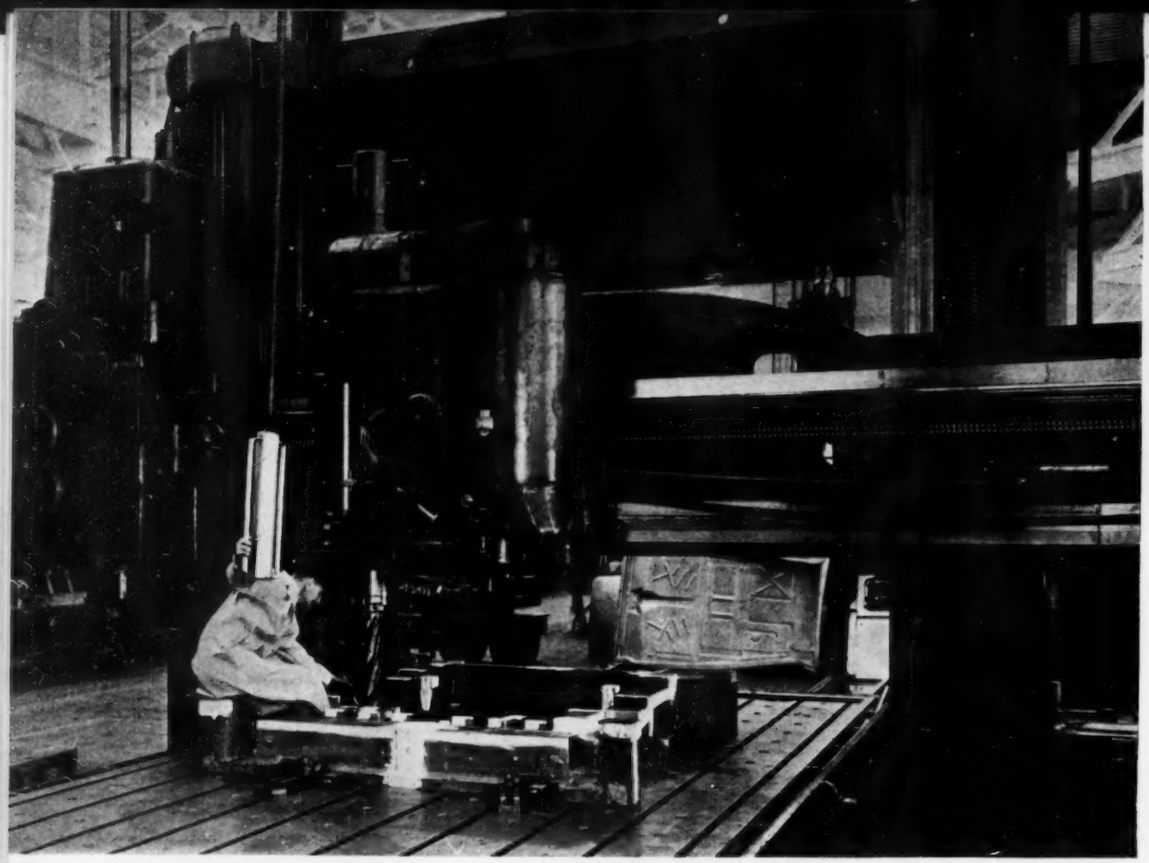
A portion of the employee's incentive earning is contingent upon quality performance

Courtesy Ford Motor Co.

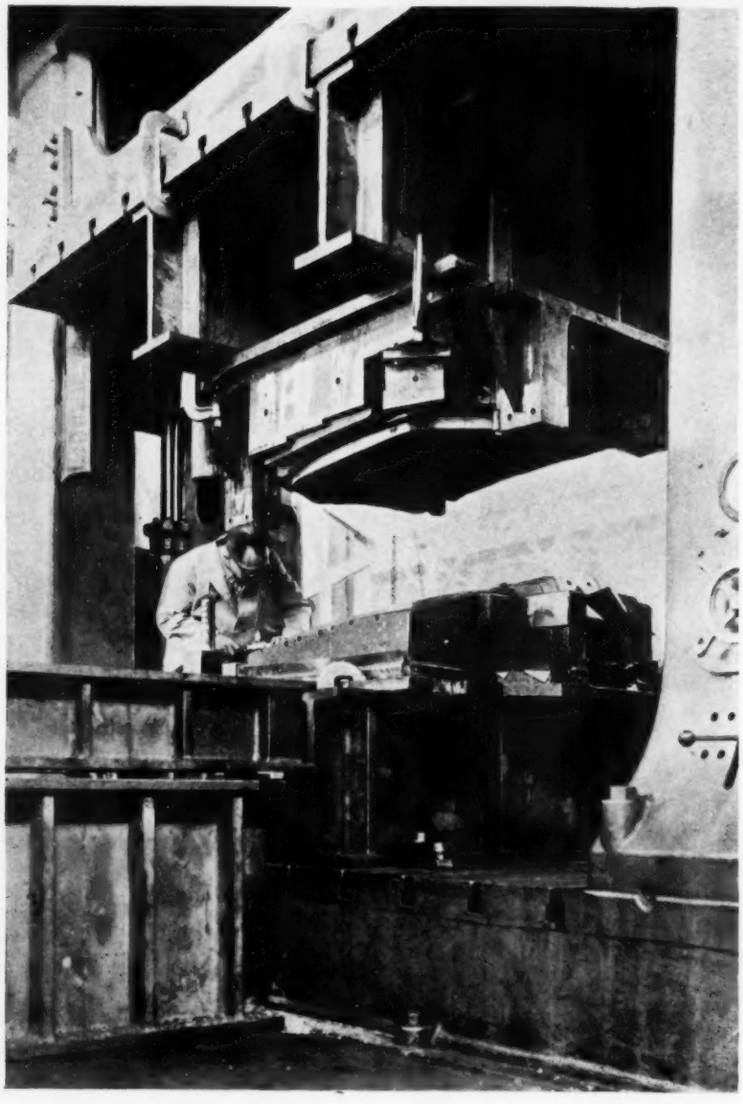


Milling Speeds and Feeds

An error in one of the charts published with the article "Factors Affecting Milling Speeds and Feeds", (*AM*—Vol. 81, page 375), has been called to our attention by Nicholas J. Capello, of Haddonfield, N. J. The horizontal scale showing feed per revolution in the chart of "Speeds and Feeds for Face Milling Cast and Malleable Iron", page 377, now shows only one-half the correct value. This scale should read the same as the similar scale on the chart shown on page 379.



Steel plates, up to 8 in. thick, are cut by a city-gas machine which takes work 54 in. wide by 12 ft. long



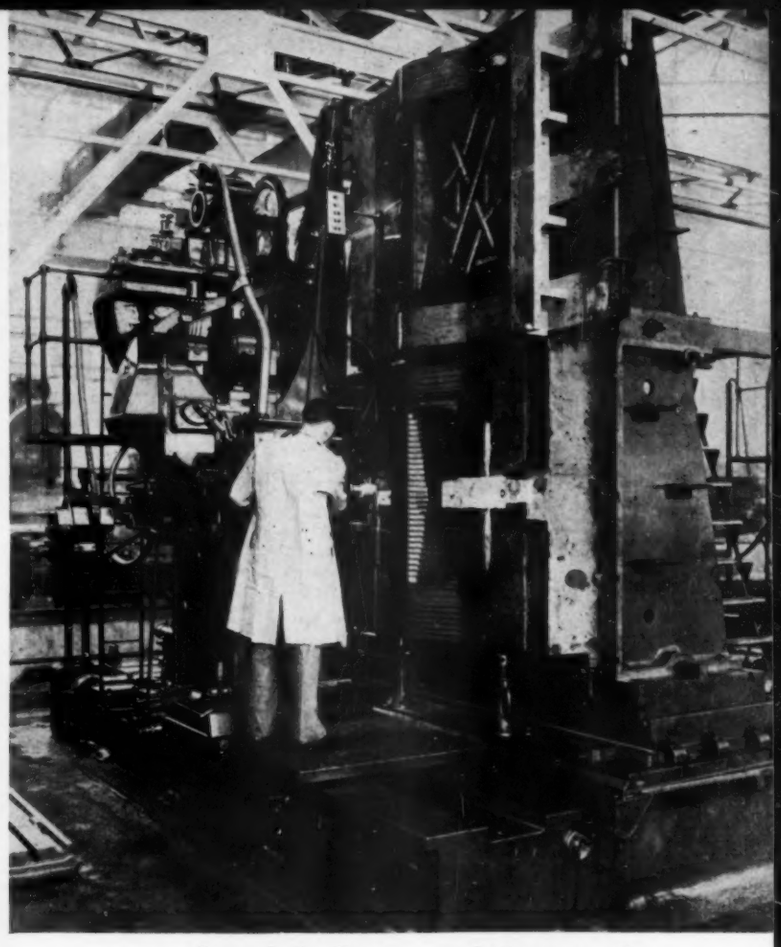
Controlled by push buttons, the 12-ft. milling machine roughs out large die blocks

A 50-ton press is one of six machines used to spot finished dies

Body Dies

OCCUPYING 39,000 sq.ft. of floor space, the new body die shop recently equipped by the Grand Rapids Stamping Division of General Motors Corporation, is divided into two bays each of which is 75x260 ft. One bay is specifically designed for the production of large dies and contains heavy machinery, including a special openside milling, boring and drilling machine, an adjustable rail die block milling machine, a special die-sinking machine, an extra-heavy double-housing planer and four Keller die-sinking machines. The second bay is for lighter work. Next to the windows in this bay are work benches where die makers put on the finishing touches.

All work progresses through the shop without backtracking, much as in an automobile assembly factory. Each bay is served by a 50-ton overhead electric crane with a 75-ft. span;



Large body dies are roughed out on die sinking machines; four have been installed

Some machines, such as this grinder, may be moved about the shop to minimize work handling

by Fisher

A newly equipped die shop is put into production as the tooling season starts

the bay where heavy dies are machined also has a 30-ton crane. There are 40 jib cranes for handling two-ton loads, easing the task of the die maker.

The shop, which is operated by the Fisher Body Division, has 75 new machines in all and employs an average of 260 men. Wherever possible, the equipment is brought to the work rather than the work being taken to the machine. As an example, a portable grinding machine for the squaring of die surfaces is moved about the shop. Although it is mounted on wheels, the wheels can be locked firmly in place at any spot where it is to be used.

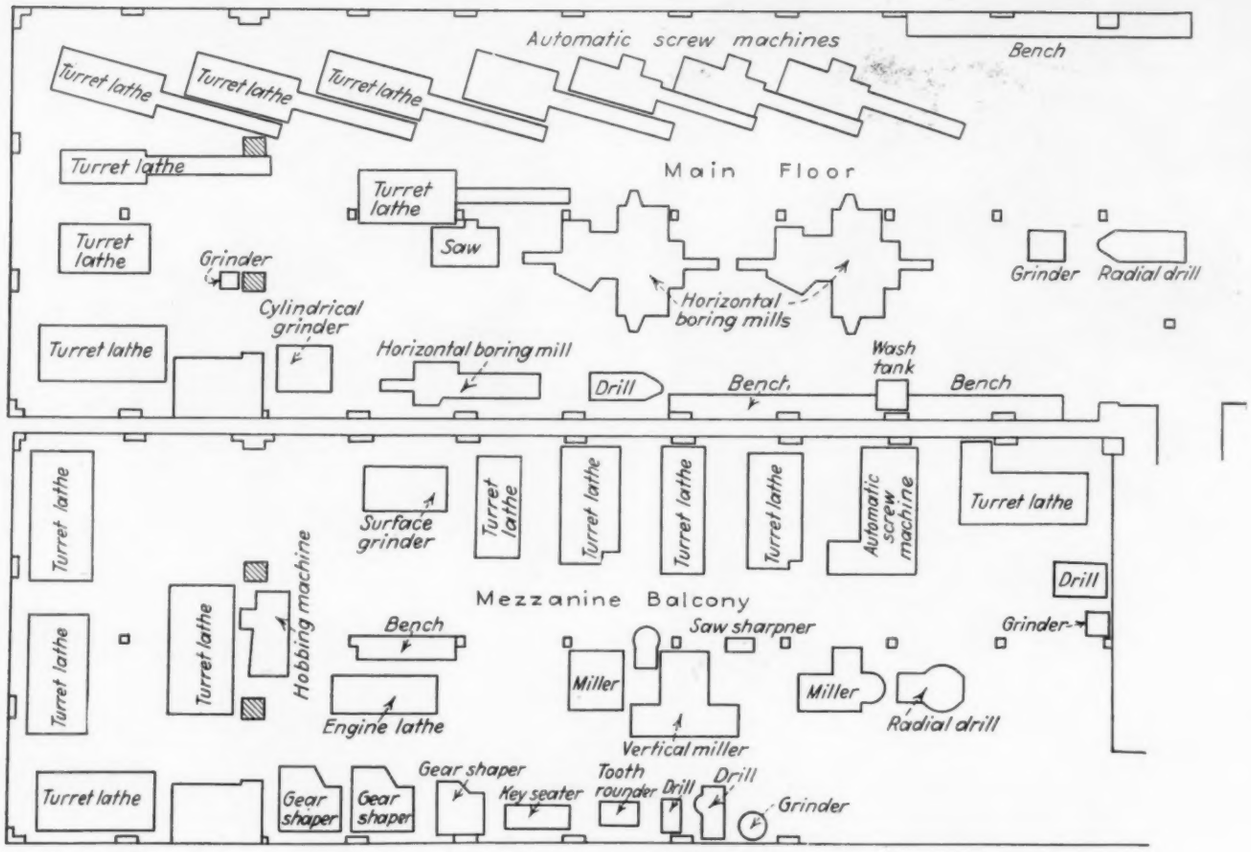
Six spotting presses have been installed for the spotting of dies—three 10-ton presses, two 20-ton and one 50-ton. A large number of new-type surface and cutter grinders are part of the shop's equipment. Radial drills have special circular tables which give greater working space and permit the complete radius of the arm to be employed. This arrangement takes up more floor space than normal, but increases greatly the usefulness of the machines.

Shop Illumination

Great care has been taken to provide the best possible lighting. Sides of the shop are almost entirely of glass, giving excellent daylight working conditions. Alternate rows of Mazda and mercury vapor lights run the length of the shop about 20 ft. apart, the blending of these lights causing a greenish light easy on workmen's eyes at night. In addition there are individual electric lights on each work bench. On the bottom of each overhead electric crane are electric lights so that no shadows are thrown in the shop as the cranes pass under the regular lighting fixtures.

The shop has a well-equipped heat-treating department consisting of gas-fired carburizing furnaces, a Homo furnace used only for drawing purposes, lead and cyanide furnaces, and a blacksmith unit. Alongside the carburizing furnaces are racks where dies taken from the furnaces are air-cooled. In front of the furnaces is a water-jacketed quenching tank built into the floor.

Heavy steel plates are cut by a flame-cutting machine using natural city gas in a room adjoining the heat-treating department. The machine can cut steel up to 8 in. thick and can handle work 54 in. wide and 12 ft. long without resetting. A track runs from the die shop into the flame-cutting room; a special portable fixture on car trucks transports the work and holds it in position during the cutting period.



Hoist Costs Lowered

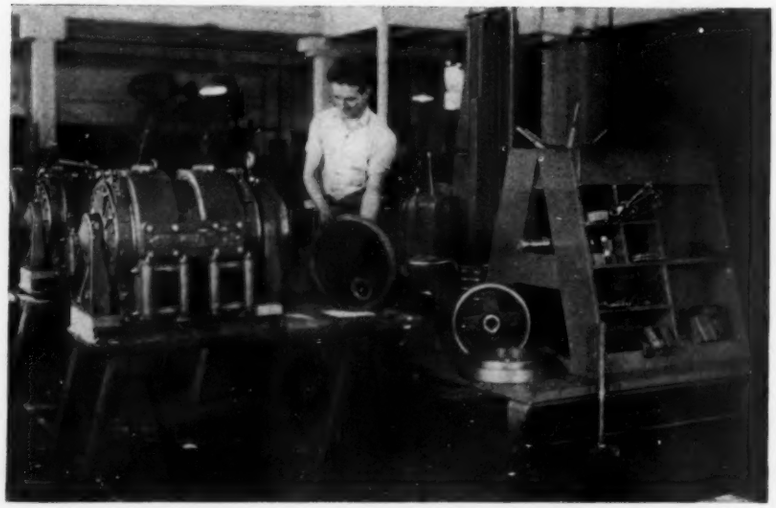
by Rearrangement of Manufacturing Department

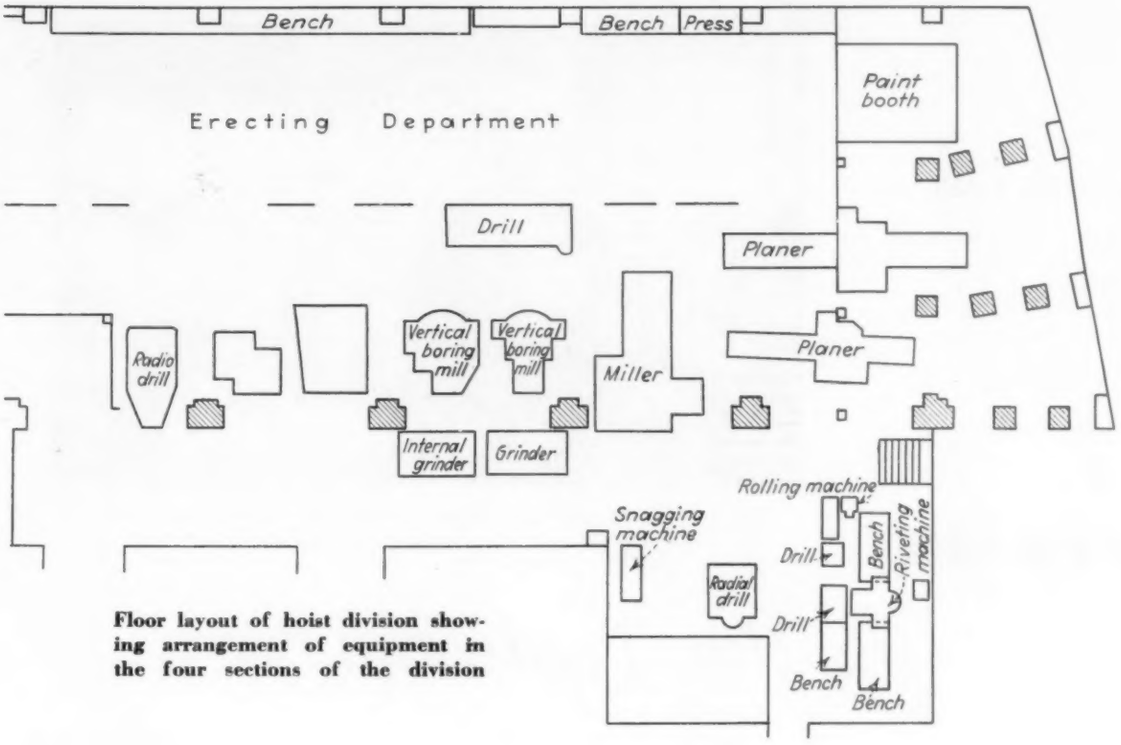
AT THE Claremont, N. H., plant of the Sullivan Machinery Company, makers of mining and contractors' machinery, improvement in business has permitted the production executives to improve methods and equipment, and thereby lower manufacturing costs.

The factory buildings at Claremont are not new, but they are unusually well supplied with large windows. Built on the edge of a mountain stream, they vary from one to five stories with the slope of the ground. As a result, transportation from floor to floor has its problems. The solution chosen is to departmentalize the plant by products, keeping most of them confined to one or two floors.

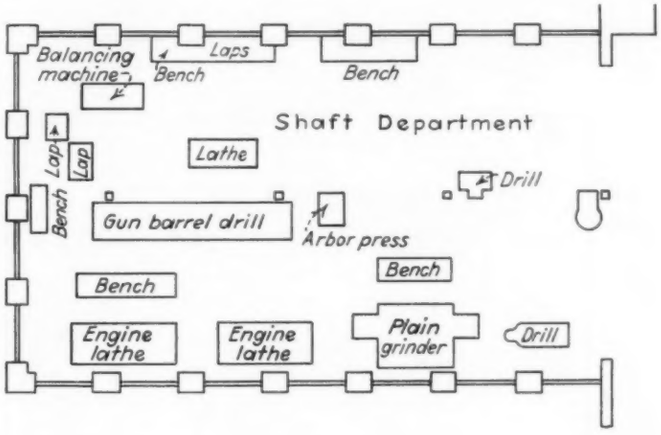
One of these departments is the hoist division. A typical hoist is illustrated in the accompanying shop

Erection floor showing four hoists being assembled on horses with assembly rack at right. Paint spray booth is at left in rear





Floor layout of hoist division showing arrangement of equipment in the four sections of the division



view; manufacturing lots vary in size from six to fifty. Parts are manufactured in lots of 6 to 300. Some 4,000 pieces are involved in the manufacturing operations for which 80 machine tools are employed. These tools are grouped on two floors as shown in the plans.

About 50 per cent of the floor space is occupied by machine tools which have been grouped to eliminate trucking service so far as possible. Bar machines have been lined up along the windows to give the best possible lighting and to keep feed tubes out of the way. A Jones & Lamson chucking machine is at the end of the line for second operation work, and a 3A Warner & Swasey is used for rope drums located nearby. These machines are under the mezzanine balcony which occupies one end of the main shop.

On the balcony itself are the chucking machines and allied equipment for producing gears, gear hubs, and like units. Four Potter & Johnston chucking machines are grouped at the end of the balcony to be run by one operator who sets his own tools, and grinds the drills and single-point tools he uses. The largest gear hub used is too big for the Potter & Johnstons and is finished complete on an Acme. Cut time is long enough to allow the Acme operator to do a drilling job on an adjacent Barnes drill.

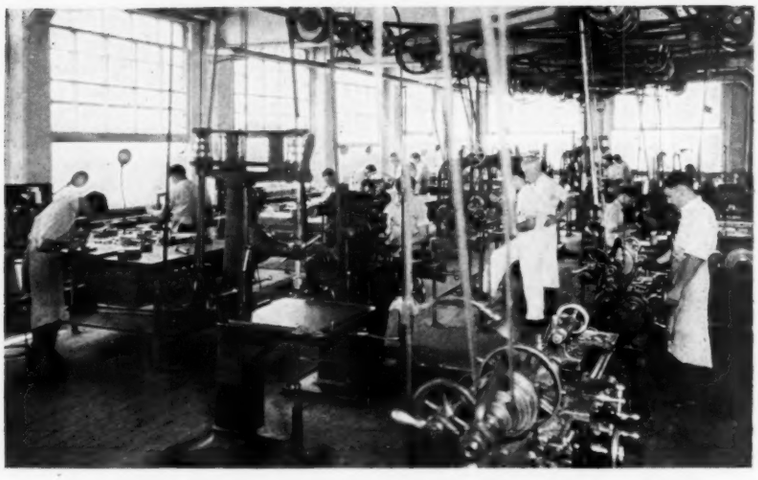
Gears turned and faced on the Potter & Johnston's go direct to the gear cutters and thence to stores. Drums on which internal teeth are to be cut, go to a nearby Blanchard to have a seat ground before they reach the Fellows machines.

Erection is done in the south-east end of the department where crane service is available. Here the larger machines, planers, vertical boring mills, horizontal boring machines and radial drills are located. Back of them, on the best foundation in the department, are the grinders to which parts come directly from the nearby heat-treating department. Near the grinders is a small group of machines and benches for assembling brake bands. Here the flat steel is drilled and rolled into band form, and brackets are riveted on.

Hoists are assembled on horses, as illustrated, and are then trucked into the paint spray booth. From the booth, they are elevated to the upper floor and trucked to finished stores. The parts are carried in assembly racks as shown, each rack being capable of holding parts for six hoists.

Shafts are turned and recentered on two engine lathes, and drilled on a gun barrel drill in a smaller department back of the main shop. After grinding they go up to the balcony to have keyways milled. This arrangement involves extra transportation, but as the choice was to put the milling machine in one of the two departments, it was decided to put it in the balcony as there was more milling work in the gear department than in the shaft department.

FRED H. COLVIN
Editor



At its Dayton plant, National Cash Register has set a separate machine shop section aside for its apprentices

Recruits *for the Toolroom*

National Cash Register's course in toolmaking provides a good example of steps being taken to fill ranks thinned during the depression

TOOLMAKING APPRENTICE First Year During the first year the Apprentice is required to attend the Owl Class in Blue Print Reading.	
1st Mo.	HELPER SUPPLY ROOM - CRIB #2 Handing out hand tools and stock parts peculiar to Jig, Fixture and Gauge Work.
2nd Mo.	HELPER SUPPLY ROOM - CRIB #2 Handing out hand tools and stock parts peculiar to Jig, Fixture and Gauge Work.
3rd Mo.	HELPER SUPPLY ROOM - CRIB #1 Handing out hand tools and stock parts peculiar to Punch and Die Work and small tools.
4th Mo.	HELPER SUPPLY ROOM - CRIB #1 Handing out hand tools and stock parts peculiar to Punch and Die Work and small tools.
5th Mo.	HAND SCREW MACHINE - CENTERING MACHINE & CUT OFF SAW. MACHINE SEC. Taugat cut off, centering, drilling, reaming, tapping and chamfering. Use of drills, reamers, scales, plugs etc. Applicastion of Speeds and Feeds.
6th Mo.	HAND SCREW MACHINE - CENTERING MACHINE & CUT OFF SAW. MACHINE SEC. Taught cut off, centering, drilling, reaming, tapping and chamfering. Use of drills, reamers, scales, plugs etc.
7th Mo.	LATHE Taught rough turning counterbores, reamers, arbors and cutters. Use of Calipers and Micrometers. Application of Speed and Feeds.
8th Mo.	LATHE Taught finish turning, taper turning and external threading. Use taper receivers, thread wires, micrometers and receivers.
9th Mo.	LATHE Taught face plate set ups, boring and turning. Use of Angle Irons, bolts and clamps and balance weights.
10th Mo.	LATHE Taught working to detail drawings in producing parts for general tool construction.
11th Mo.	SHAPER Taught plain flat and edge work on tool and stock details. Use of square, grinding of tools etc. Application of Speed and Feeds.
12th Mo.	SHAPER Taught step work, angles, radii and form shaping. Use of Bevel Protractor, Depth Micrometers and radius gauges.

TOOLMAKING APPRENTICE Second Year The second year the Apprentice is required to attend the Owl Class in Mechanical Drawing.	
1st Mo.	MILLING MACHINE - HAND Taught cut off, slotting, use of saws, lubricants, speeds and feeds.
2nd Mo.	MILLING MACHINE - POWER Taught plain milling, use of straight and spirel fluted cutters also application of speed and feeds.
3rd Mo.	MILLING MACHINE - UNIVERSAL Taught Dividing Head plain and spiral, also universal vise.
4th Mo.	MILLING MACHINE - AUTOMATIC Taught set up and operations of Hobbing Machines and Gear Cutters. Application of Speeds and Feeds.
5th Mo.	BENCH LATHE Taught set up and grinding of small diameters, external and facing. Application of proper grinding wheel and practice.
6th Mo.	GRINDER - EXTERNAL Taught plain Cylindrical Grinding and use of Amplifier Gauges.
7th Mo.	LAPPING - EXTERNAL Taught use and application of abrasives to precision lapping of plug gauges and studs etc.
8th Mo.	LAPPING - INTERNAL Taught use and application of abrasives to precision lapping of Receiver Gauges, Bushings etc.
9th Mo.	GRINDER - SURFACE Taught plain surface grinding to tool and die details. Use of proper grinding wheel.
10th Mo.	GRINDER - SURFACE Taught set up of angle and step grinding of tool and die details.
11th Mo.	DIE SHOE ASSEMBLY AND GET READY Taught assembly of die shoes line up, fit and checking, also lay out from detail drawing of die parts. Drilling, reaming, Co-boring and tapping.
12th Mo.	PUNCH AND DIE WORK

INCREASING demand for good toolmakers, coupled with the facts that few have been trained since 1930 and many older men are no longer available, for one cause or another, makes toolmaker training a live question. Numerous plans for training young men to become toolmakers have been put forth. The exact plan to be followed depends to a large extent on the human material available, and the size and equipment of the plant.

Picking Them Out

If boys or young men who have had no experience with tools are to be trained, there is much elementary work to be done before toolmaking is to be seriously considered. On this account some shops prefer to pick their apprentices from bright young men in the production department. These men already have many of the fundamentals of machine operation and machine work, and make excellent material for future toolmakers. They can be trained in much less time than boys or men with no practical background.

One of the primary requisites for a toolmaker is the physical co-ordination we call skill or deftness. The naturally clumsy man must overcome this handicap to get far in the toolroom. Sensitiveness of touch in women was found a great asset in toolrooms during the war, as well as on inspection work. But deftness alone is not enough except in toolrooms where the work can be sub-divided. A mechanical background, or machine sense, is a great asset where any original work is to be done. Where a shop can pick its toolmaker apprentices from the production department, both deftness and machine sense can be easily discovered among the possible students.

The National Cash Register Company has a four-year course for toolmakers that has much to commend it. Details of the schedule for each month are given in the lists or diagrams. They will be well worth careful study by those interested.

Where They Start

Generally speaking, the first four months are given over to having the apprentice become familiar with the different kinds of tools and parts. The time is divided between jig and fixture work and the use of punches and dies. Two months on the hand screw machine follow, after which come four months on the engine lathe; two months on the shaper complete the first year.

Ten months of the second year are devoted to milling, bench lathe work, grinding and lapping. During the last two months of this year the apprentices begin actual work on tools, thirteen months being given to punch and die work. It will be noted that several months of the third year are spent in the shop under direct supervision of journeymen instructors. Apprentices remain on the payroll of the toolmaking department.

Fourth Year Schedule

Jig, fixture and gage work follows, the same sort of shop work being done as on punches and dies, as outlined in the schedule. The details listed show that great care has been given to the various operations that enter into the making of tools.

It will also be noted that all apprentices attend evening classes on such subjects as reading of blue prints, mechanical drawing and shop mathematics. This entire course has been carefully thought out and should be of great service to those who have not had similar experience.

TOOLMAKING APPRENTICE

Third Year

The third year the Apprentice is required to attend the Owl Class in Shop Mathematics.

1st Mo.	PUNCH AND DIE WORK
2nd Mo.	PUNCH AND DIE WORK
3rd Mo.	PUNCH AND DIE WORK
4th Mo.	PUNCH AND DIE WORK
5th Mo.	PUNCH AND DIE WORK
6th Mo.	PUNCH AND DIE WORK
7th Mo.	PUNCH AND DIE WORK
8th Mo.	PUNCH AND DIE WORK
9th Mo.	PUNCH AND DIE WORK
10th Mo.	PUNCH AND DIE WORK
11th Mo.	PUNCH AND DIE WORK
12th Mo.	JIG BODY ASSEMBLY Taught milling, drilling, reaming, fitting and assembly of Standard Jig Bodies.

TIME - 12 MONTHS

Taught repair, change and making of new

Blanking Dies
Forming Dies
Shaving Dies
Piercing Dies
Compound Dies
Combination Piercing & Shaving Dies

This work will be done under the direct supervision of a journeyman instructor to whom the apprentice has been assigned as a helper until such time as his understanding of the processes involved will permit him to shift for himself.

During this period the Apprentice will be assigned to other departments at different intervals, total time not to exceed one month, to witness, experience and use the tools upon which he has worked.

Apprentices will remain on the Toolmaking Department payroll during these intervals.

TOOLMAKING APPRENTICE

Fourth Year

The fourth year the Apprentice is required to attend the Owl Class in Advanced Shop Mathematics.

1st Mo.	JIG, FIXTURE AND GAUGE WORK
2nd Mo.	JIG, FIXTURE AND GAUGE WORK
3rd Mo.	JIG, FIXTURE AND GAUGE WORK
4th Mo.	JIG, FIXTURE AND GAUGE WORK
5th Mo.	JIG, FIXTURE AND GAUGE WORK
6th Mo.	JIG, FIXTURE AND GAUGE WORK
7th Mo.	JIG, FIXTURE AND GAUGE WORK
8th Mo.	JIG, FIXTURE AND GAUGE WORK
9th Mo.	JIG, FIXTURE AND GAUGE WORK
10th Mo.	JIG, FIXTURE AND GAUGE WORK
11th Mo.	JIG, FIXTURE AND GAUGE WORK
12th Mo.	JIG, FIXTURE AND GAUGE WORK

TIME - 12 MONTHS

Taught repair, change and making of new

Jigs:
- Locating
- Feather pinning
- Drill

Fixtures:	Gauges:
Profile	Milling
Mill	Drilling
Tapping	Tapping
Filing	Profiling
Straightening	Engraving
Bending	Forming
Engraving	Receiver

This work will be done under the direct supervision of a journeyman instructor to whom the apprentice has been assigned as a helper until such time as his understanding of the processes involved will permit him to shift for himself.

During this period the Apprentice will be assigned to other departments at different intervals, total time not to exceed one month, to witness, experience and use the tools upon which he has worked.

Apprentice will remain on the Toolmaking Department payroll during these intervals.

Quicker Gear Changes *in Thread Milling*

By modifying the gear change unit and using a simple time chart, only two gears need be changed for a great majority of set-ups

W. S. BLUTHARCH

IN THE aircraft shop with which I am connected we were constantly going through the usual process of changing gears for each thread milling set-up. Lots are small, but we must cope with many different diameters and thread pitches, and with an extremely wide range of materials. Some means had to be devised to simplify the gear changing problem and obtain more economical production by so doing.

Table I—Feed Chart for Circle-C Hobs Spiral Fluted

Material	Hardiness Lb./Sq.In.	Feed, In. Per Min.
Steel	60,000	2.75
"	80,000	2.50
"	125,000	2.25
"	150,000	2.00
"	175,000	1.75
"	200,000	1.50
Bronze	High tensile	1.75
		1.50
Bronze	Manganese	1.75
		2.00
Bronze	Tobin	2.25
		2.50
Aluminum	Alloys	3.00

The method adopted consists of using a set feed in inches for each material and strength of that material, plus a simplified change gear set-up. Table I gives a feed chart for various materials, while Tables II and III compare the original and present sets of change gears. Note that the largest gear *A* in Table III has a maximum of 90 teeth.

One Chart Is Used

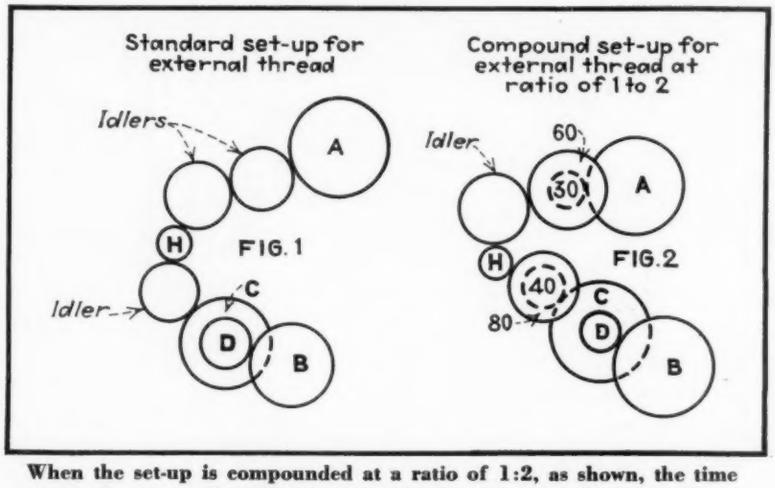
The set feed in inches per minute for each different strength or kind of material has a very definite advantage. It permits the use of one simple chart for standardized gear changes as compared with a number of complicated charts furnished by the manufacturer.

The set feed is constant regardless of diameter. By dividing the feed into the circumference, the time in minutes to thread mill a given diameter is quickly found. Multiply this result by 60 and get the time in seconds. When cutting the same pitch thread, say 20 pitch, it should be necessary to change only one gear with each change in diameter. If another pitch is selected only two gears need be changed. Development of the basic chart for milling time in seconds, Table IV was derived from the following facts:

A thread milling machine has three main motions: (1) rotation of the thread hob at suitable cutter speed; (2) rotation of the work through one revolution, and (3) movement of the thread hob forward a predetermined length or thread pitch by means of the leadscrew. Ordinarily the ratio of motor speed to countershaft speed is about 4 to 1. One end of the countershaft drives the thread hob, and the other end drives through a transmission of approximately 60 to 1. This reduction in speed gives a very slow one to the shaft that drives the train of gears on the end of the machine. By means of gear train combinations it is possible to arrive at certain pitches and the revolution of the work spindle in a set time.

From Fig. 1 it is apparent that the time element is governed by the number of teeth in driven gear *A* divided by the number of teeth in driver gear *H*, times the r.p.m. of the gear shaft *H*. To find the correct speed of the driver gear shaft *H* start with a countershaft speed of 410 r.p.m. (as shown on the chart). The countershaft is connected to a transmission which has two different sets of gearing. The first reduces the speed four to one, and the second has gears in ratios of 24/84 × 24/96, a reduction of 14 to 1. Gear *A* is set on a shaft which connects to the work spindle by means of a worm gear with a reduction ratio of 4 to 1. Thus from the countershaft to the work there is a total reduction of 4 × 14 × 4 = 224 to 1. Stated as a formula, minutes per revolution of work spindle:

$$M = \frac{\text{No. of teeth in gear } A}{\text{r.p.m. of gearshaft } H \times \text{no. of teeth in gear } H}$$



When the set-up is compounded at a ratio of 1:2, as shown, the time required to cut a thread is doubled, but the thread pitch is not altered

Table II—Old Style Gear Change

Threads	A	C	D	B
6				
7	60	84	40	100
8	100	100	30	120
9	72	108	40	120
10	70	70	24	120
11	60	90	30	110
12	60	90	30	120
13	60	78	24	120
14	60	84	24	120
16	48	96	30	120
18	40	90	30	120
20	36	90	30	120
24	30	90	30	120
26	30	78	24	120
28	30	84	24	120
32	30	96	24	120

Table III—Standardized Gear Change

A	C	D	B
80	120	60	120
60	84	48	120
90	120	40	120
80	120	40	120
72	120	40	120
80	120	30	120
60	78	24	120
60	84	24	120
90	120	20	120
80	120	20	120
72	120	20	120
60	120	20	120
60	84	48	120
30	96	24	120

Assuming gears *A* and *H* have the same number of teeth, the formula becomes:

$$M = \frac{A}{\frac{\text{r.p.m. of countershaft} \times H}{\text{total gear reduction}}}$$

$$= \frac{A}{\frac{410 \times H}{4 \times 14 \times 4}}$$

idlers in identical ratios, or going back to the old style gear train. To reduce or to increase the surface speed per minute of the milling hob, it is necessary to use either the 2½-in. or the 3⅝-in. pulley as shown on the chart.

For example, with steels having an ultimate strength of 200,000 lb. per sq. in., use the 2½-in. pulley and

Table IV—Thread Milling Time in Seconds

A Gears—Driven ↓ \ H Gears—Drivers →	20	24	28	32	36	40	44	48	55	60	72
90	148	123	106	92	82	74	67	62	54	50	41
84	138	115	98	86	76	69	63	57	50	46	38
80	131	109	94	82	73	66	60	55	48	44	37
78	128	107	91	80	71	64	58	54	47	43	36
72	118	98	84	74	65	59	53	49	43	39	34
70	115	96	82	72	64	57	52	48	42	38	33
60	98	82	71	62	55	50	45	41	36	34	28
55	91	75	65	57	50	45	41	36	33	30	25
48	80	66	56	50	44	40	36	33	29	26	23
40	66	55	47	41	37	33	30	28	24	22	20
36	60	50	42	37	33	30	27	25	22	20	17
30	50	41	36	31	28	25	23	21	18	17	14
24	40	33	28	25	22	20	18	17	15	13	12

Formula $S = \frac{4A \times 56 \times 60}{H \times 410}$ = seconds 2½ pulley = $\frac{410}{315}$ seconds

Based on 3⅛ diam. pulley Motor 1500 r.p.m. 24/84 24/90 gearbox

Pulley diam.	Countershaft speed	Cutter speed
3⅝	475 r.p.m.	250 r.p.m.
3⅛	410 "	217 "
2½	315 "	165 "

Multiplying by 60 to change the time from minutes to seconds, the formula becomes:

$$S = \frac{60 \times 4 \times 14 \times 4A}{410H}$$

$$= \frac{4A \times 56 \times 60}{410H}$$

as shown on the chart.

The simplified table of gear changes reduces the number of gears to change when setting up for a different pitch. The *A* gears for each pitch are as large as possible to increase the range of time without compounding both

also smaller hobs with spiral flutes, so as not to exceed 60 surface ft. per min. The 3⅛-in. pulley, upon which the chart is based, is used when cutting steels with an ultimate strength of 135,000 per sq. in., and this is done without undue wear on the hob. The 3⅝-in. motor pulley provides a countershaft speed of 475 r.p.m. to increase the speed of the machine for cutting aluminum alloys.

Our work ranges from ¼ to 4 in. in diameter. On large diameter work where the cutting time is beyond the chart limits, we simply compound the idler gears on both sides of the driver in the train. This is done in a ratio that will give the required time within the limits of the *H* driver gear.

Corrosion Resistant Materials

The experience gained and the materials which have been made available, in an effort to resist the severe corrosion to which sewage disposal equipment is subjected, should be of value to any industry where long life of product is essential. Then too, there are times when it is not feasible to apply and places where it is impossible to maintain protective coatings.

The chromium-nickel-iron alloys are well known for their corrosion-resistant, high-strength properties. These alloys may contain any amount of nickel from 3 to 35 per cent and any amount of chromium from 8 to 35 per cent. The best known is the 18-8 chromium-nickel-iron alloy, usually referred to as stainless steel.

Where it is necessary to clean such articles as valves, injectors by strong solutions such as ferric chloride, it has been found that high nickel alloys containing approximately 58 per cent nickel, 14 per cent chromium, 17 per cent molybdenum and 5 per cent tungsten are required to give long life of the parts to be cleaned.

In many cases it is desirable to have castings which have good mechanical properties and yet are resistant to corrosion. Ni-Resist, a cast iron containing approximately 14 per cent nickel, 6 per cent copper and 2 per cent chromium has been found definitely superior to ordinary cast iron. Certain parts which have been cast from tin bronzes are inadequate in mechanical properties. However, if particular combinations of tin and nickel are used in the bronze with suitable heat-treatment, strength comparable to some of the alloy cast steels may be achieved.

Other combinations for castings which seem to possess sufficient margin of corrosion resistance to make them useful in some instances are high strength, low alloy steels and iron, such as the rough steel containing 1 to 5 per cent nickel and the nickel-chromium cast iron containing approximately 3 per cent nickel and 1 per cent chromium.

The nickel silvers, a group of white bronzes containing from 8 per cent to 30 per cent nickel, provide a solid corrosion resistant metal without requiring coatings which wear off.

Abstracted from a paper by G. L. Cox, International Nickel Company.

Templets
for Difficult Curves

A. R. KLIGMAN

THERE are occasions when it is impractical to lay out curves on a templet sheet by means of a compass. At the same time the standard group of curves which are used in layout work may not be satisfactory for the job at hand. The trumpet-shaped nozzle shown on Fig. 1 is one such design. In this case a maximum variation of plus or minus 0.005 in. was allowed for the diameters indicated in the figure. It was at first thought that a few straight tapers could be used, the intention being that the number of these tapers would be such that the error due to the substitution would be well within the permissible limits. However, not only precision in size of the successive sections was important, but the profile had to be continuous and smooth.

This requirement led to the substitution of an arc of a circle for the curve *AB*. Using an arc of a circle appeared to be very desirable because it would permit scribing a smooth and continuous curve and would call for little work with the height gage. In this case the size of the radius was over 9 ft. which made it impractical to lay out the curve on the templet sheet by means of a compass.

In order to solve the problem, a geometrical law was applied according to which the vertex of an angle α describes an arc of a circle if the sides of the angle pass through two given points. Accordingly, two points *M* and *N* were selected on the extended arc *ACB*. Referring to Fig. 2 these two points correspond to M_1 and N_1 of the templet *T*. Pins were fastened to the templet at these two points for guiding the scribing templet *U*. This latter was made with slots *GG* and *HH* which were equivalent to the cord lines *MC* and *CN* marked on Fig. 1. A scribing pin *P* was located at the vertex of the angle α which was equivalent to point *C* on Fig. 1.

Two more rounded pins *Q* were provided at convenient places on templet *U* to maintain parallelism between *T* and *U*. In moving the templet *U* across the templet *T* the scribe at point *P* describes an arc similar to the arc *MCN* on Fig. 1. It can readily be seen that only points M_1, P_1 and N_1 need be plotted on templet *U*, and points M_1, A_1, B_1, N_1, K_1, D_1, F_1, L_1, on templet *T*. Points A_1, B_1, D_1, and F_1 were plotted only to limit the arcs to those portions which were of interest.

Referring to Fig. 1, we find:

From *AOJ* $a^2 + (b - 6)^2 = R^2$ (1)

From *COV:*

$(a - 0.21)^2 + (b - 3)^2 = R^2$ (2)

From *BOW* $(a - 0.5)^2 + b^2 = R^2$ (3)

Solving these simultaneous equations we get:

$a = 113.511$ in. $\quad b = 12.438$ in.

Substituting these values in (1) we find: $R = 113.694$ in.

Now that *a*, *b* and *R* are known it is possible to determine how close the arc of the circle approximates the desired curve. Taking *S* as the first point of the curve for comparison and assuming that S_1 is the point on the circular arc which is, like *S*, 1½ in. away from axis *X*, we consider the triangle $S_1\,OI$. In it:

$S_1 = b - 1\frac{1}{2} = 10.938$, and $OS_1 = R = 113.694$

Consequently:

$OI = 113.167$ and $IJ = 0.344$

$S_1 S = 0.344 - \frac{1}{2}\,(3.685 - 3) = 0.0015$ in.

Or the error in diameter of the trumpet at the considered section, due to the manner of construction, is not over 0.003 in. All other sections were investigated similarly and found to be even closer to the desired shape.

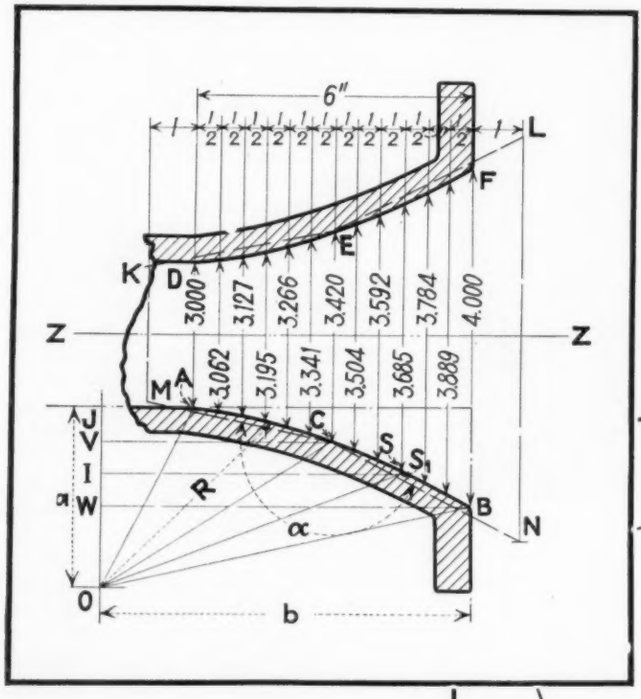


Fig. 1—This was the problem in curve layout

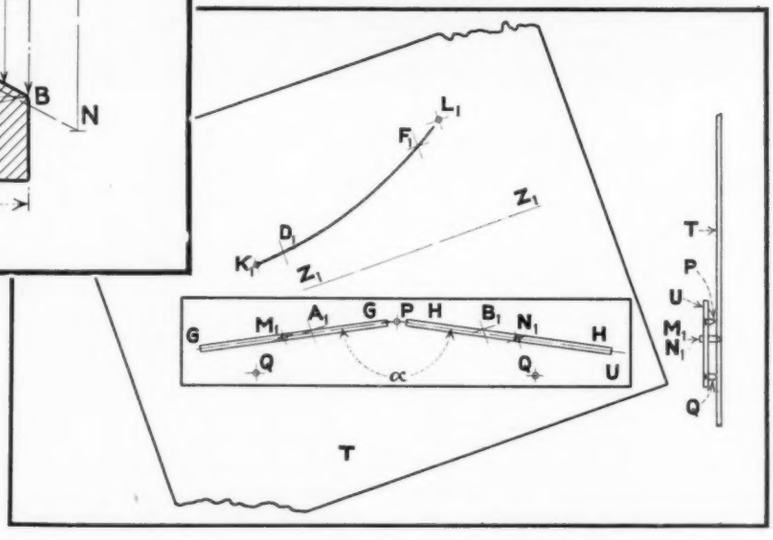


Fig. 2—Making templets for curves of large radii

Ideas from Practical Men

Fixture for Turning Mold Bases

H. L. WHEELER

Split cast-iron molds for glass bulbs are mounted on interchangeable steel bases, details of which are given in Fig. 1. Their production in fairly large quantities in a small jobbing tool shop presented some interesting problems in turning the outsides.

The bases *A* are semicircular in shape and the blanks *B* are cut from a 2x¾-in. bar of flat cold-rolled steel in a power hacksaw. The corners *C* are cut off in a milling machine to remove surplus stock. Two holes *D* are drilled and reamed in a suitable jig of simple construction.

For the turning operation, the fixture shown in Fig. 2 was made to screw on the spindle nose of the lathe. Designed to hold two blanks, it is provided with four locating pins *A*, two of which engage the two holes previously drilled and reamed in each blank. The two blanks are securely held on the fixture by the loose center plate *B* which is pressed against them by the tailstock center. The operation consists of a roughing and a finishing cut with ordinary lathe tools.

Indicator Clamp for the Surface Grinder

J. R. WHITTLES

After truing the table of a surface grinder, it should be checked for flatness at all points by a dial indicator. Sometimes the indicator rod is clamped to the wheel guard by any clamp that can be found in the toolcrib, while at others it is held by the knurled-head screw that locks the cover of the wheel guard. By either of these methods of holding the indicator rod, the full length of the table can not be checked because but one end will travel past the indicator, due to the indicator not being held in the center of the wheel head.

The clamp illustrated can easily be attached to the wheel guard so that the indicator will be in the center of the wheel head, enabling the full length of the table to be checked. The clamp *A* is held to the cover of the wheel guard by the screw *B*, and the indicator rod *C* is held in an extension of the clamp, the metal being slotted at *D* so that it can be sprung by the screw *F* to hold the indicator rod tightly in the hole provided.

In checking the table, it is traversed very slowly by hand so that the indicator can be read at all points of its traverse. The table is moved in or out by the cross-feed at each traverse so that it can be checked at every point.

Fixture for Making Bushings

CHARLES F. HENRY

Belt conveyors are used to a considerable extent in fruit packing houses. These require rollers, frequently of wood, and the rollers are bushed to prevent too rapid wear. The illustration shows how one shop makes these bushings, easily and at low cost, in an engine lathe.

The casting shown is fastened to the saddle of the lathe carriage so as

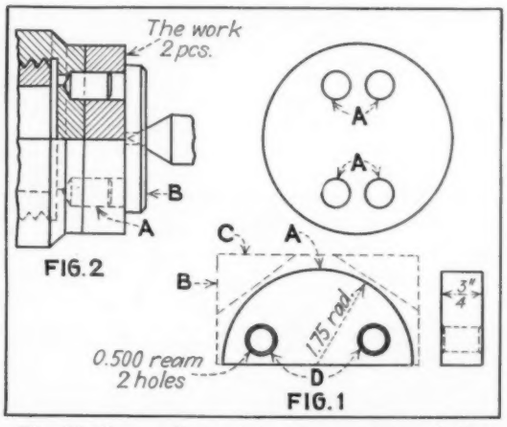
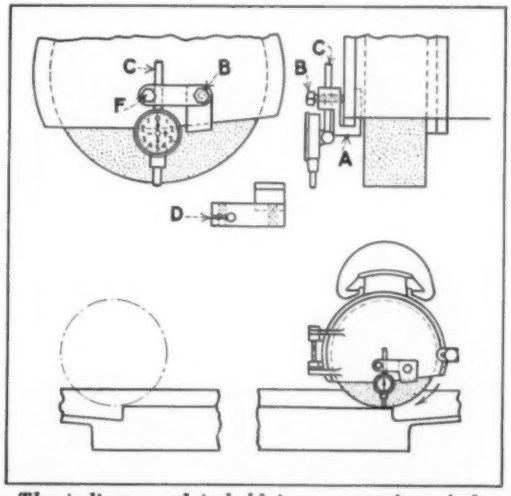


FIG. 1

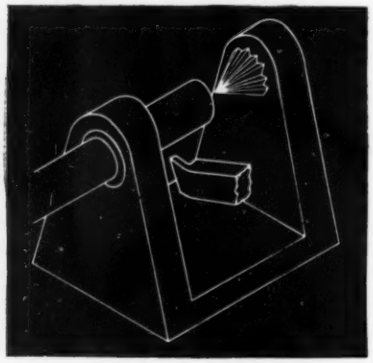
The blanks are located by pins engaging drilled and reamed holes. They are securely held by a plate pressed against them by the tailstock center



The indicator rod is held in an extension of the clamp, so that the indicator will be in the center of the wheel head

to bring the center in line with the lathe spindle. The side which supports the steel tube used for bushing the rollers carries a bronze bushing in which the tube runs. The other side of the casting carries a tapered reamer for removing the burrs made by the cutting off tool.

The tube is pushed through the hollow lathe spindle and through the bronze bushing so as to project the required distance from the chuck, and the end is reamed. Then the carriage is moved back to a stop that brings the cutting off tool in position to cut



off the tube at the right point for the length of bushing wanted. The reamed end of the bushing is put inside the roller and both bushings are reamed on outer end under a drill press or in a lathe. This makes a rapid method of handling a simple job. The frame can be welded up instead of cast.

Screw Tests Fit of a Thread Gage

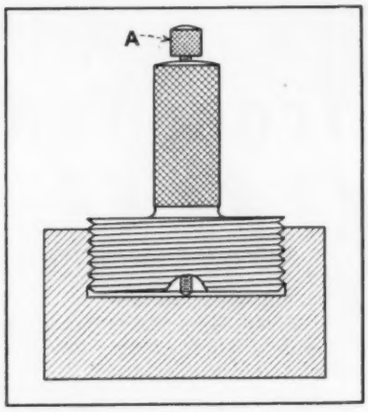
H. MOORE
Meanwood, Leeds, England

Because it is difficult to determine the fit of a large thread gage in work that is comparatively light, the work is often held in the vise so that the gage can be shaken to tell how it fits.

A better way I have found is shown in the illustration. The gage is drilled axially and is tapped for the test screw *A*. It is not necessary to tap the gage for its whole length, but only for an inch or so.

In use, with the gage in the work, the test screw is brought lightly into contact with the bottom of the threaded hole. If the gage is loose in the hole, the amount of looseness can be approximately determined by how far the test screw can be screwed down after it is in contact with the bottom of the hole, lifting the gage.

If the threaded hole in the work is not a blind one, a piece of flat metal clamped across one end will serve for the test screw to abut against.



A screw threaded axially through a large thread gage and bearing on the bottom of the hole can be used to test the fit of the gage

Homemade Hydraulic Press

W. H. BURLEIGH

We have used the homemade, 12-ton hydraulic press illustrated for pressing in cylinder liners of feed pumps, piston rods in pistons, bushings, etc., and for general all-around work.

Both the head and the foot of the press are made from 6-in. channel irons having $\frac{5}{16}$-in. plates welded at the backs for added strength. The two tierods are $2\frac{1}{2}$x$\frac{5}{8}$-in. flat bars having reamed holes at 3-in. centers for pins for adjusting the distance of the head from the foot. All the material except the hydraulic jack was picked up around the plant and easily put together.

The press is used in a horizontal position and its height from the floor is adjusted to the center line of the work by $\frac{3}{4}$-in. bolts which can be made to any desired length.

An English Locating Tool

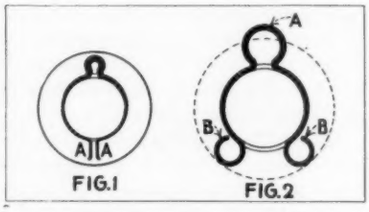
J. T. TOWLSON
Enfield, Middlesex, England

Some years ago, faced with a need for a simple means of locating gudgeon pins, ball bearings, and spur gears, the device illustrated was evolved. I called it a "circlip." It was made in different sizes from tempered steel wire of rectangular section.

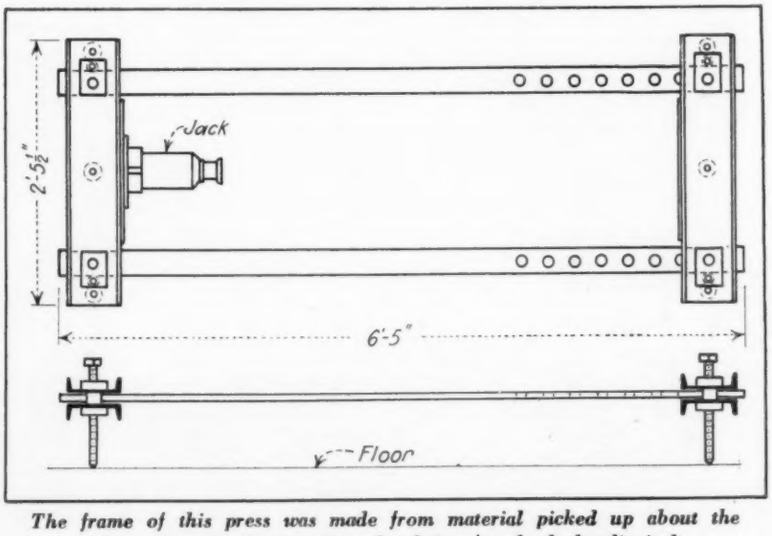
Referring to Fig. 1, in application the circlip is placed over the end of the shaft or pin and is sprung into a narrow groove cut therein, serving as a stop for the part to be located. After locating and securing the part, the circlip is removed by distending the horns *A*, and it can be used any number of times without losing its elasticity.

To provide a circlip that could be placed on a shaft in a location remote from the ends, the circlip illustrated in Fig. 2 was made and was so proportioned in maximum and minimum thickness that its elasticity was distributed over its circumferential length. It is sprung into the groove by pressing down on the loop *A*, spreading the horns *B* automatically.

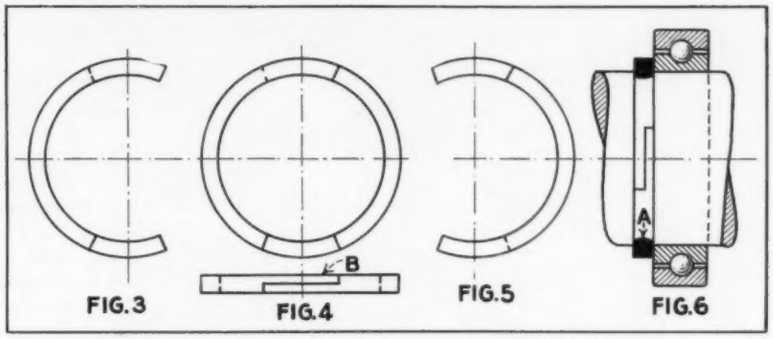
Another type of circlip is shown in



Figs. 1 and 2—Two types of circlips. The first has horns for spreading it manually. In the second the horns are automatically spread by pressing them on the shaft



The frame of this press was made from material picked up about the plant, the only direct cash outlay being for the hydraulic jack



Figs. 3 and 6—Another type of circlip. It is in two parts that overlap, much as in a piston ring. The parts are sweated together after the device is in place

Figs. 3 to 5, its application in locating a ball bearing in a position remote from the shaft ends being shown in Fig. 6. The groove *A* in the shaft is filleted at the bottom with a round nose tool in preference to being flat. The circlip is made in two parts, each part being more than half a circle and the extensions beyond the half circles are cut down to overlap, as shown at *B* in Fig. 4. The parts are hard rolled from low-carbon shear steel, the inherent elasticity of that material providing a good grip as the ends are passed over the shaft.

In use, the parts are sprung over the shaft and into the groove, the overlapping parts having been tinned and coated with solder. By the application of a spirit lamp, the solder is melted and the parts are sweated together. In removing the circlip the solder is melted by a spirit lamp and the parts can be easily pried apart.

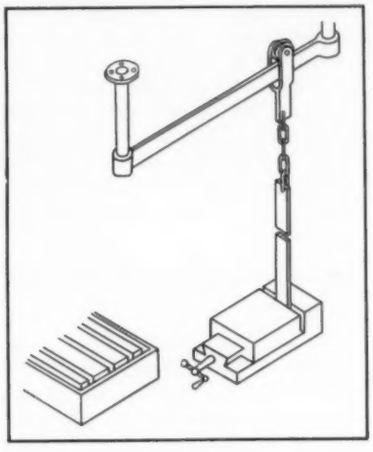
Aerial Vise Storage

CHESTER H. FRANKLIN

In a small shop where space was at a premium, I recently saw a unique method of storing a heavy milling machine vise. Fastened to the ceiling near one end of the milling machine table was an overhead rail carrying a trolley as shown. Suspended from the trolley was a few links of chain and a flat bar of steel about ¼ or ⅜x2 in. Clamped to the lower bar was the heavy vise as shown.

When the vise is needed it will be moved back toward the table, the table lowered if necessary, and the end run under the vise. When the table is moved up so as to take the weight of the vise, the jaws will be opened and the hanging bar run out of the way on the overhead track.

This sequence is reversed when the vise is no longer needed, and the vise is out of the way but always ready for use. The few links of chain over the bar provide flexibility in handling.



Gage for Checking Center Distance of Holes

JOHN E. HYLER
R. G. LeTourneau, Inc.

Illustrated is a gage for checking the center distance of holes, in which the contact points are steel balls having concentric shanks, the shanks being a snug push fit in holes drilled and reamed in a bar at accurate center distance. Regardless of the size of the balls, they are central with the holes in the bar, of which there may be as many as are desired.

While the balls in the holes shown may be right for checking some given job, by transferring ball *A* to hole *B* in the bar, the gage will be usable for checking another job where the holes are at a greater center distance. Very little friction is involved in using a gage of this type as each ball makes line contact only with the hole. The balls should, of course, be of the same diameter as that of the holes being checked.

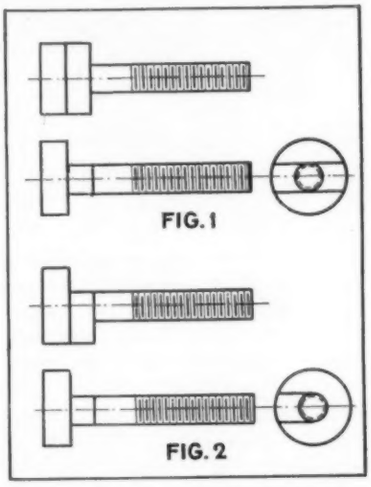
In using the gage for checking blind holes, if the air compressed by entering them or vacuum is formed by taking them out, the trouble can easily be overcome by drilling a tiny hole through each ball and its shank.

Faceplate Bolts

C. F. FITZ

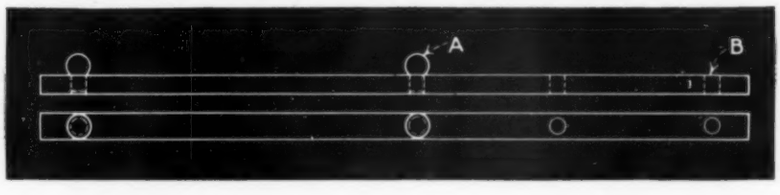
Every machinist who has done faceplate work knows the impossibility of holding the work in place with one hand and using two wrenches with the other, one to prevent the bolts from turning and the other to tighten the nuts on the clamps.

To obviate such conditions and save the workman's temper, the bolts



Flats under the bolt heads engage the slots in the faceplate and prevent the bolts from turning as the nuts are tightened on the clamps

illustrated in Fig. 1 were made. The flats under the heads are a free fit in the faceplate slots and yet prevent the bolts from turning as the nuts are tightened on the clamps. By using such bolts, the workman can hold the work in place with one hand while the other is free to manipulate the



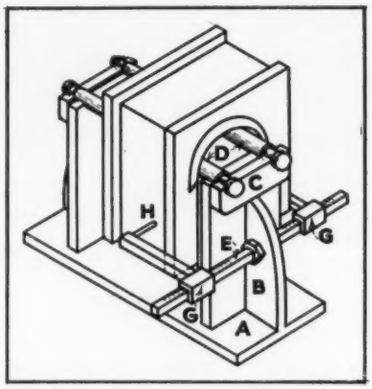
wrench in tightening the nuts down.

However, it sometimes happens that some of the slots in the faceplate are in such positions as will prevent the bolts from being placed quite far enough apart to allow the work to go between them, while others will not permit the bolts to be placed quite near enough together to permit effective clamping. For such cases the bolts are made as shown in Fig. 2, one side of the flat parts being cut down to the bodies and rounded.

Centering Driving Boxes

FRANK C. HUDSON

Keeping the driving axles square with the frame when re-wheeling a locomotive is one of the points to be watched by the erecting foreman. For unless the driving boxes on each side are square with the frame the main bearings are affected as well as those



Pointers H on each side of the fixture check the sides of the driving box with respect to the bore and show whether the bore is central

of the main connecting and side rods.

The pedestal jaws in the frame are presumably square and uniformly spaced on each side. But unless the driving boxes are bored exactly central with the sides the two sides may not line up when the boxes are put in place. One bright young foreman of a road that prefers to remain nameless, tells me it is next to impossible to get bores exactly central even with good machine equipment.

This foreman devised the gage illustrated to check the crown brass bore with the sides of the driving box that bear against the shoe and the wedge. The gage consists of a cast base *A* with two uprights that have a bracing rib *B* and a steel plate *C* at the top. Resting in the plates *C* are two carefully ground bars *D*, that are parallel with each other and equidistant from the rib *B*.

The rib *B* supports a bar *E* that is held by check nuts on each side of *B*, the center of this bar being round and of such diameter that the nuts go over the square part of the bar. This bar is carefully graduated on each end and is so set in *B* that the graduations are equidistant with the parallels *D*. On each end of the graduated bar are the sliding arms *G*, each carrying a pointer *H*, of uniform length, so that accurate measurements can be taken on each side of the driving box.

After the driving boxes are bored they are checked on this gage and any difference between the two sides is stamped on the box itself. When the boxes reach the erecting floor the erector notes the difference between the boxes that go at each end of the same axle and makes the shoes of proper thickness to bring the axle in line. In addition he checks the relation between the boxes in each pair of jaws so as to secure the proper center distance for the axles.

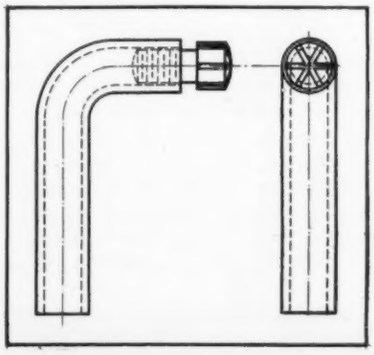
Careful attention to these details saves time on the erection track and also insures better running bearings on both the axles and crank pins. This is a good example of the refinements that are coming into the railroad shop and the interest being taken by the younger shop executives.

Emergency Wheel Dresser

GEORGE B. HARRAN

We call the tool illustrated our emergency wheel dresser because it has saved the day when our supply of regular wheel dressers was exhausted and the ones ordered failed to arrive on time.

There is nothing complicated about either the construction or the use of the tool. It consists simply of a piece of pipe bent at a right angle and a fillister-head capscrew fitting freely therein. The original screwdriver slot in the capscrew is cut entirely

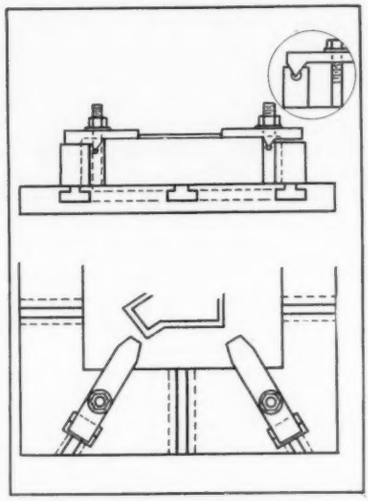


A fillister-head capscrew having cross slots through the head and slipped into a piece of pipe makes an emergency tool for dressing abrasive wheels

through the head and two or more similar slots are added, as shown in the illustration.

While the length of the screw is not important, it should be at least twice as long as its diameter so that it will have a good length of bearing in the pipe. For dressing wheels of different widths two or three sizes of the tool should be made. The diameter of the screw body should be about equal to the width of the wheel to be dressed and the nominal size of the pipe should be the same as the diameter of the screw.

In use, the screw is slipped into the pipe up to its head and the tool is held at the side of the wheel. The screw head is brought into contact with the face of the wheel and is slowly moved back and forth.



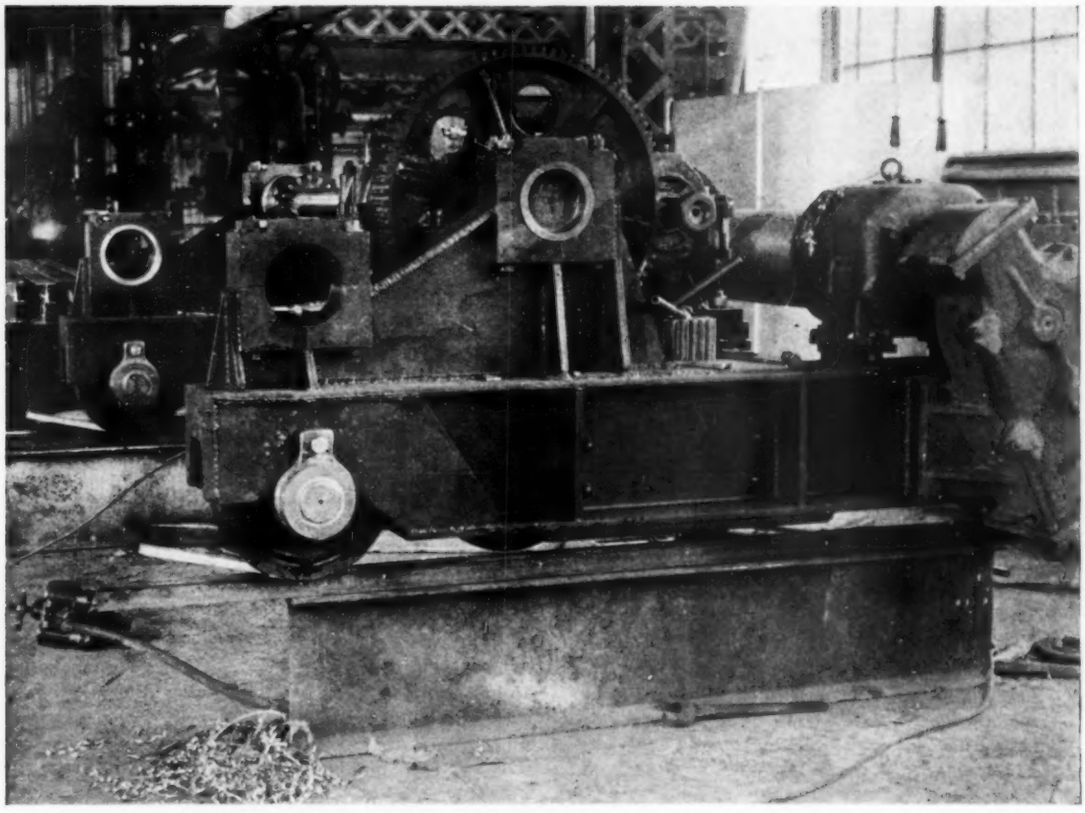
Where dies are held by clamps having integral V's in the heels engaging V-notches in the packing blocks, they are not likely to go adrift

Clamps for Holding Dies

F. DOUGHTY
Shipley, Yorkshire, England

Presses engaged in work where dies have often to be changed call for close attention, especially the method employed in securing the dies. Vibration is much in evidence and rigidity is required to hold the dies in place. Toward that end the clamps illustrated are put forward. They have V's on the undersides of their heels that engage V-notches in the packing blocks. Vibration of the press is not so likely to cause the clamps to slip and permit the die to go adrift as in the case of ordinary clamps.

This method of clamping permits quicker setting up because the clamps and the blocks act as units. While the sketch shows the V's integral with the clamps, they can be welded.



Crane Bridge Work

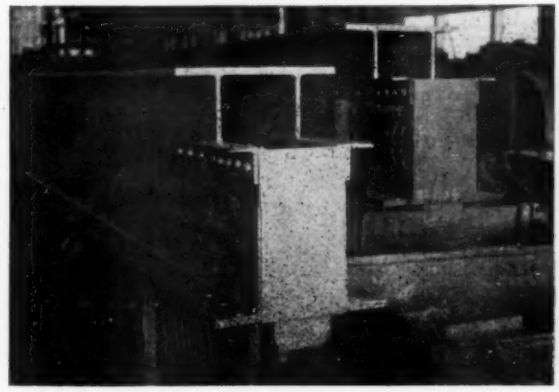
FRANK C. HUDSON

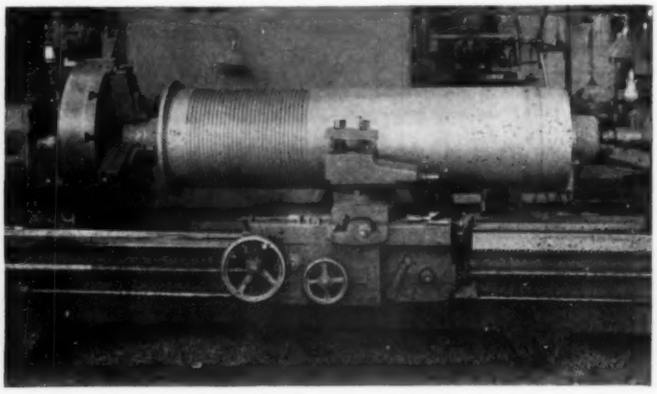
ONE of the many instances in which welding is being used in regular construction work is in building the bridge work for traveling cranes in the shop of the Shepard-Niles Crane & Hoist Corporation, Montour Falls, N. Y. As in other plants where extremes are avoided so far as possible, there are combinations of welding and riveting, steel plates and castings.

The framework for the bridge trolley, above, is a good example of such combinations. Here the side frames are built up of plates, steel blocks for bearings, and a casting, part of which is shown at the right. This casting carries the gear train between the motor and the line axle which drives the trolley across the bridge. The sides are cut from plate and welded as shown, with a few rivets to position the cross beams that tie them together. Bearing blocks are cut from the solid and welded in place. One advantage of such a construction is that additional ribs or reinforcements can be put in at any time.

Another example of welding is to be seen below. Here the box girder for the long cross member of the crane bridge is built up of two heavy I-beams by welding the flanges together at top and bottom. The girder is stiffened further by plates welded at the ends. Here again rivets are used in places for holding the small side angles in place at the bottom of the notch, or step, cut out at the end.

A hoisting drum, such as is used in the bridge trolley, is shown in the lathe below. The drum has been turned and grooved at one end for the hoisting rope. It is now ready to have a similar groove, which is in reality a deep, half-round thread, cut at the other end.





Pin and Screw Supports *for Drilling Jigs*

X—Some of these work supports are good; some are bad. Weak features are pointed out, and better designs are suggested

C. W. HINMAN
Tool Engineer
Kobzy Tool & Electric Manufacturing Company

DUST CAPS are sometimes a necessary protection around a sliding pin, Fig. 70. Cast-iron work, in particular, produces a fine dusty grit along with the chips, and this grit may enter around a sliding pin and choke its free operation. A felt washer is probably more efficient than a cap for dust protection, and its application is shown in Fig. 71.

The spring collet *A*, with an internal expansion screw *C*, is used for locking and unlocking support pin *B* in Fig. 71. The operator advances collet *A* by pushing screw *C*. This action, by the angular construction shown, elevates pin *B* into contact with the work. The tapered screw *C* is then tightened, which expands and locks the collet, and also pin *B* in supporting position. The unlocking movements are the same but in reverse order, and the coiled compression spring naturally forces *B* to maintain its angular sliding contact on *A* while withdrawing from the work. This attachment is sure, positive and quick to operate.

If necessary to design a hand screw that will automatically lock itself when tightened, the one given in Fig. 72 can be used. This is useful in cases where machine vibrations, during long operations, loosen the fastening prematurely. The tapered nose *A* is split four ways, which allows it to close around the threads on draw rod *B* when *A* is tightened. The hardened washer *C* is internally fitted around nose *A*. When *A* is tightened, rod *B* is in tension on the work fastening. When the fastening becomes positive against the work and tightening continues, the washer forces the split nut to close and lock on rod *B*. There are dozens more than the notorious "57 varieties" of nut- and screw-locking inventions on the market. Most of them, when properly applied, are useful in tool and machine construction for securing "shake proof" members, or locking difficult fastenings.

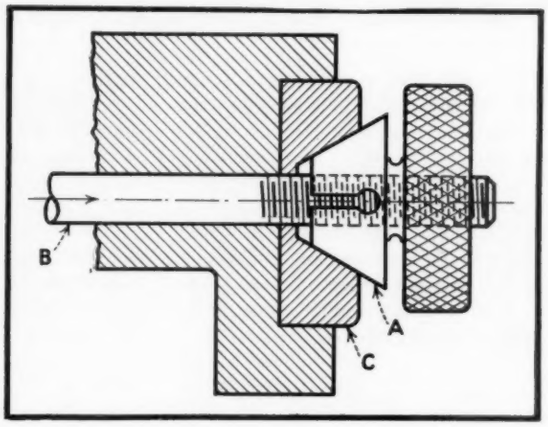
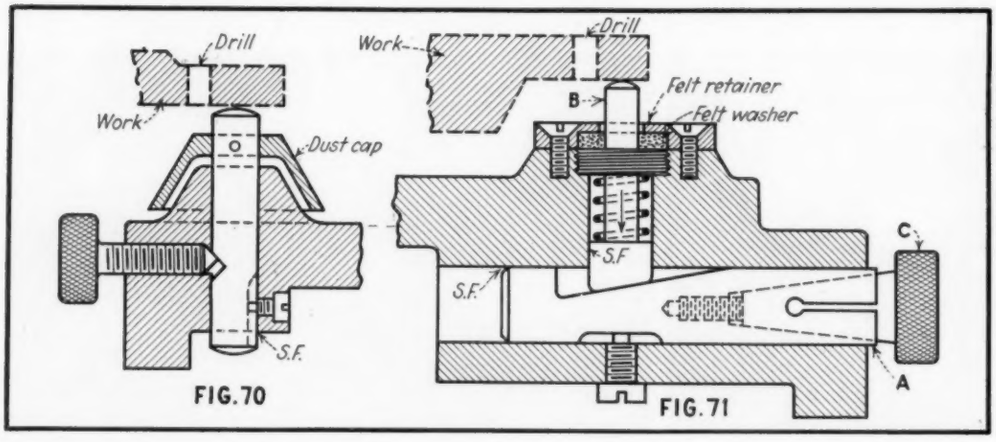


Fig. 72—Split nose *A* of this hand screw tightens on the threads of draw rod *B* and will not loosen under vibration



Figs. 70 and 71—Fine, dusty grit produced in drilling cast iron is prevented from choking a sliding pin by adding a dust cap or a felt washer

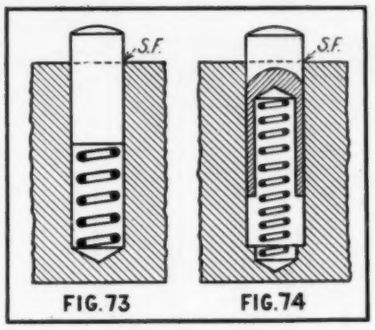


Fig. 73—Wrong way to insert a coil pin under a pin. Fig. 74—The right way. A longer spring is more resilient and provides a much better guide for the pin

The method for inserting a coil spring under a pin is purposely shown the wrong way in Fig. 73. The long spring that enters a deep concentric hole in the pin, Fig. 74, is obviously more resilient and provides a longer and better pin guide. The diameter of a hole for a compression spring should be the diameter of the free coil, plus the diameter of the spring wire. This allows sufficient clearance for the necessary increase in coil diameter when the spring is compressed.

Injury to Polished Work

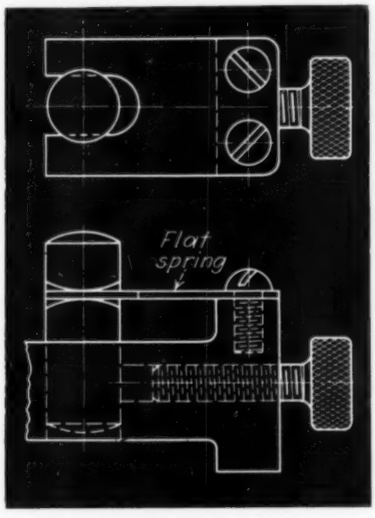
When locking a screw or rod, by the side approach of another screw, a copper or a similar soft metal plug is inserted under the point of the locking screw to protect the locked member from injury. Clamps and pins in contact with finished and polished work are provided with leather or fabric plugs at points of contact to prevent marring. The torsional marks of a screw point against polished work are eliminated by using a non-torsional leather faced clamp or washer, between the screw point and the work.

A flat spring is sometimes resorted to for operating a pin support, if the length of the pin guide is 1½ times the diameter of the pin, or more, Fig. 75. This design is used when space for a coil spring is limited in the tool, and when the pin movement is relatively small.

In attaching a loose washer on a screw point, the popular, and wrong, method is shown in Fig. 76. This design causes the washer to be either too tight for easy revolving, or so loose that it wears and falls off. A better design is given in Fig. 77, in which a shouldered pin head is counterbored into the washer, with its shank pinned through a hole in the screw body. This can be done on any screw size from ¼–28 threads, and up. It is also a good design for attaching rollers or disks on shaft ends, where a nut in front might be objectionable. This design allows easy adjustments, changes and replacements.

When necessary to apply screw pressure against the work at the bottom of a deep recess which is surrounded by an interfering flange, the design in Fig. 78 is available. Screwing an ordinary screw in and out would be too slow, but would be obviously necessary if the movement of the work is limited within the walls of the jig. The long pin *A* slides through bushing *B*. Within the bushing hole are two parallel slots, diametrically opposite, that terminate in the bushing head in right-handed 90-deg. spiral slots as shown. A projecting pin *C*, driven through *A*, rides in the slots, and locks in the spiral slots, the same as a screw, when *A* is advanced against the work, and turned. This bushing is not difficult to make. First, the straight slots are

Fig. 75—When space is limited, use a flat spring to operate a pin support



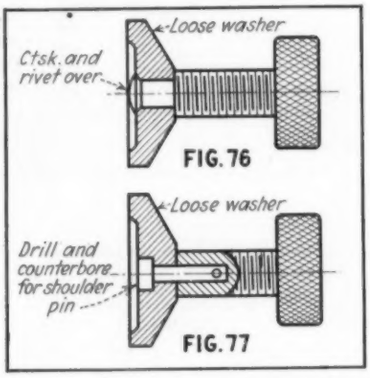
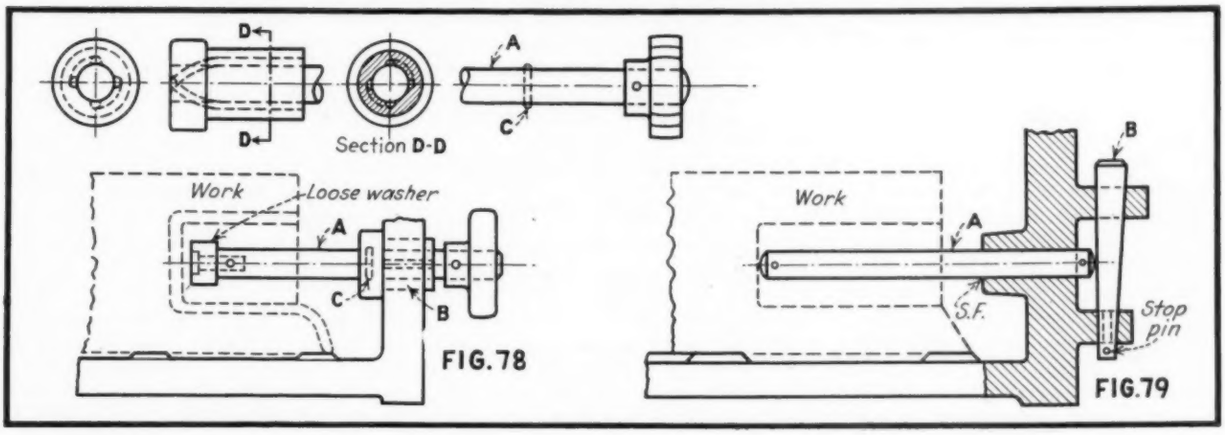


Fig. 76—Wrong way to attach a loose washer to a screw point.

Fig. 77—Correct method which allows easy adjustment, changes and replacements

Fig. 78—Pressure is applied in a deep recess by pin *C* riding in twists at the ends of slots in bushing *B*. Fig. 79—Another way is to drive a tapered key *B* against the sliding rod *A*



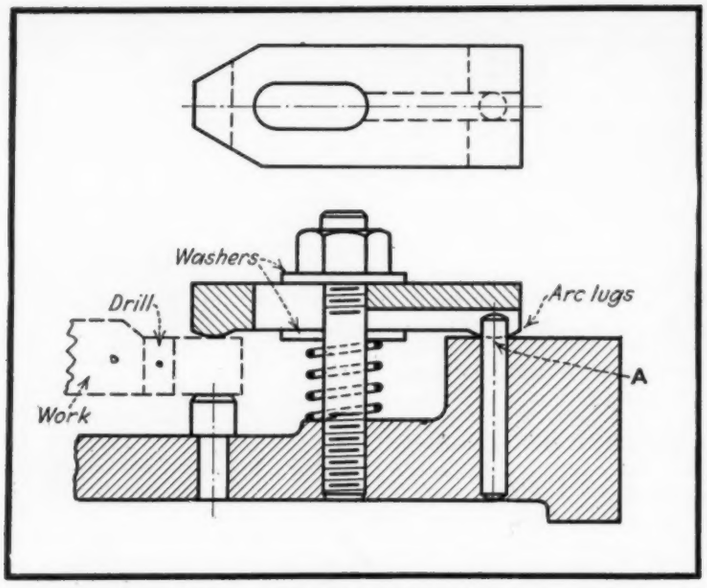


Fig. 80—Arc lugs at the right of this plain clamp prevent it from creeping when the nut is tightened

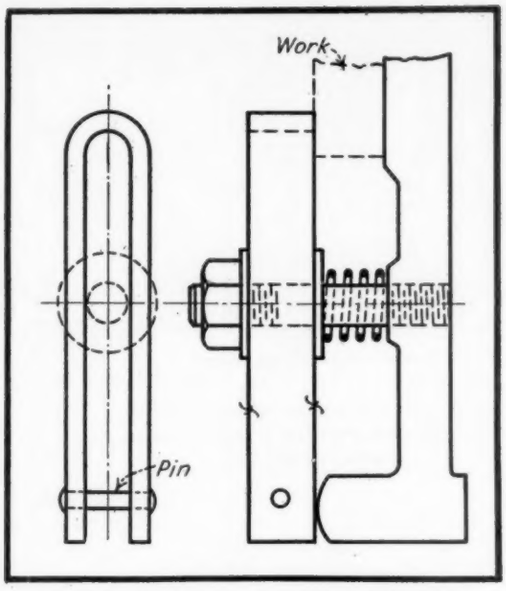


Fig. 81—U-clamps are quickly fashioned to any width or length

cut in a key-seating machine, then the spirals are chased in a lathe to meet them. The slots are easily connected within by using a small file.

Another way, Fig. 79, to obtain the same result is by using a sliding rod *A*, locked at its outer end with a tapered key *B*. Stop pins are driven through the ends of the key and rod to prevent losing them. A key is the quickest in action of all tool fastenings, and is easy to make, but it can easily distort the work because it has great locking power. Therefore it is not used where it might cause distortion. The key angle is usually tapered from 3 to 5 deg.

In large jigs, plain clamps are necessary at times for holding cast, or other, pieces of work. A typical clamp of this character is shown in Fig. 80. Longer and wider clamps than shown are often made for special purposes. The arc lugs at the right-hand end of the clamp prevent it from "creeping" when tightening the nut. This clamp will not revolve with the nut when tightening, because the positive pin *A* is straddled by a lengthwise slot in the clamp, located on the center line.

An efficient "rough and ready" clamp for quick temporary work is produced by the blacksmith, using strap steel stock, Fig. 81. The opening between the forks in this so-called, "U-clamp" straddles the tightening bolt, and rides freely around it. U-clamps are made in any necessary width and length.

The word "strength" in all tool and machine design cannot be overstressed. Clamps and supports, dowel pins, fulcrum pins and working members should always be designed as reasonably large and strong as space permits. In shop talk this means: "Make your design 'husky.'" The graduating class in an eastern engineering college received this refreshing bit of farewell advice from their old professor. "Remember that good engineering begins with a ½-in. bolt!"

Engineering designs are all simple in one respect. There is only one reason for all the broken parts in tools and machines. Failures occur because the parts were not built strong enough to "take the load." They were built for the wrong load, of incorrect strength, or both. The ever present question in design is: How strong can an operating mechanism be economically made? If conditions do not permit using formulas for computing the strength of materials, as cited in the article on hand tools (*AM*—Vol. 81, page 288), the designer must use his best judgment. The answer then depends upon the designer's practical ability in proportioning the parts and his past experience with similar failures.

In the next installment the principles in cam-locking fastenings and clamping equalizers will be discussed.

Part XI of Mr. Hinman's series will appear in an early number.

A Welding Problem

C. G. WILLIAMS

A SHORT TIME ago there was presented to me by the general manager of a plant the problem of welding facing strips of 12-per cent manganese steel, carbon 0.30, to soft steel backs having a carbon content of from 0.25 to 0.30.

Said the general manager to me, "We have tried everything we could think of except electric welding, and that is out because we must have intimate contact between both types of steel over their entire surfaces. Our trouble, and our only trouble, seems to be that when the manganese steel is heated to the welding temperature it crumbles under the hammer, and at a few points only do parts of it stick to the soft steel, the rest of it crumbles away."

My advice to him was not to attempt to heat the manganese steel to a higher temperature than is indicated by a dull red. At that point it begins to absorb heat rapidly, and in reality that heat corresponds to a white heat in low-carbon steel. Bring the manganese steel to a dull red and let it stand for a few minutes. Then when the soft steel back has been brought to the welding heat, place the two together under the hammer. Do not strike too hard or give too many blows. A steady pressure at first is better than blows. This method gave satisfaction.

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Die Springs

There are few springs subjected to the abuse that a die spring usually receives. This is often due to the desire of the die maker to use as few springs as possible, or to the design of the die which prohibits the application of enough springs safely to carry the desired load. Some of it is also due to the fact that so-called standard springs have been used with little thought given to the actual load applied on the spring even with proper die design. In any event, there is often an overloaded condition which acts adversely to spring life.

The customary die spring is made of rectangular wire to get as flexible a spring as possible in a desired space. Could round wire be used, and enough space allowed for it, these springs would in all probability give better service than the rectangular wire. Square wire is used in cases where extreme stiffness is necessary, and should only be employed for this object. As the formulas for calculations of rectangular wire springs are not often available, they are included.

Investigate Stresses

In order to combat the evil of overstressing die springs, and to obtain the greatest possible service from them, it is advisable to investigate the stress conditions under which the spring operates. Herewith is a stress life curve based on two types of material.

The lower curve is SAE 1065, and the upper curve is a special processed SAE 6150 steel. If it is possible to allow enough space in the die for low operating stresses, the carbon steel may prove satisfactory. In most cases the alloy steel has been the best because of high stresses. In order to calculate the stress on a die spring, the following formula is given:

$$S = \frac{P\,R}{K_1 b c^2}$$

In this formula:

S = stress in lb. per sq.in.
P = load in pounds
R = mean radius—that is, the outside diameter minus the wire size then divided by two
b = long side of the rectangle (wire)
c = short side of the rectangle (wire)
K_1 = constant to be found in the table

The formula for deflection of rectangular springs is as follows:

$$\text{Defl.} = \frac{2\pi\,N\,P\,R^3}{K_2\,b\,c^3\,G}$$

in which the symbols are the same as in the first formula given with the following additions:

N = number of active coils in the spring, i.e. the total number minus 2
G = 11,500,000 lb. per sq.in. for steel
K_2 = constant, the values of which are given in the table

b/c	1	1½	1¾	2	2½
K_1	0.208	0.231	0.239	0.246	0.258
K_2	0.141	0.196	0.214	0.229	0.249

In order to illustrate the stress calculations take a spring having 1¼ in. outside diameter, made of $\frac{3}{32}$x$\frac{3}{16}$ in. wire, and calculate the stresses for a 1-lb. load on this spring. Let us assume that the wire is wound on edge.

First—to obtain the mean radius:

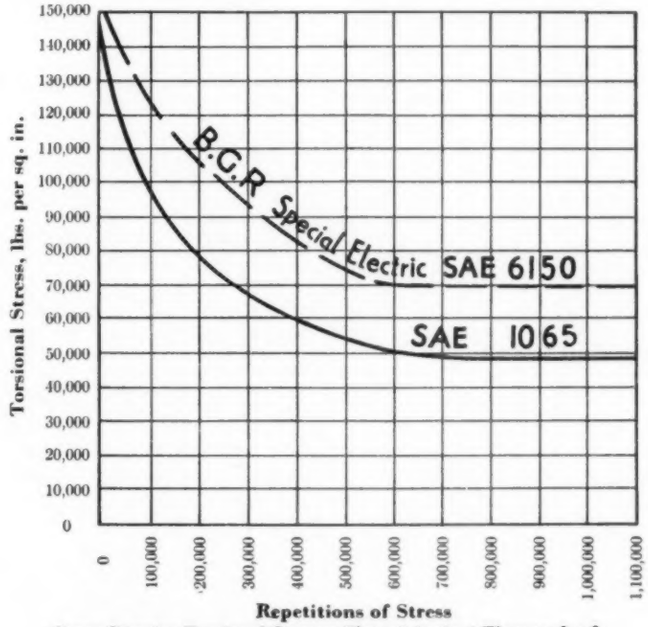
$$\begin{array}{r} 1.250 \\ 0.281 \\ \hline 0.969 \text{ mean diameter} \end{array}$$

$$\frac{0.969}{2} = 0.4845 \text{ in. mean radius}$$

Next calculate the b/c ratio as follows:

$$\frac{0.281}{0.156} = 1.8$$

For K_1 interpolate between 1¾ and 2



Curve Showing Torsional Stresses Plotted Against Thousands of Spring Movements, or Repetitions of Stress from Zero Stress up

Die Springs

K_1 for 1¾ in. = 0.239
K_1 for 2 in. = 0.246

or a difference of 0.007.

The 1.80 ratio we have is 0.05 more than the 1.75 ratio and hence corresponds to 0.05/0.25 or ⅕ the ratio number difference. This is ⅕ of 0.007 or 0.0014. Hence K_1 = 0.239 plus 0.0014 = 0.2404.

To calculate stress per pound of load:

$$\text{Stress} = \frac{1 \times 0.4845}{0.2404 \times 0.156 \times 0.156 \times 0.281}$$

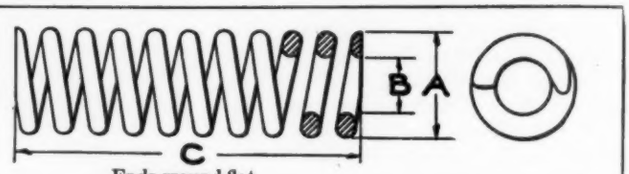
Stress = 292 lb. per sq.in. per pound of load.

If we were to load the spring with 100 lb., the stress would be 100 times this amount or 29,200 lb. per sq.in. Such a spring, as the chart will show, would be safe for repeated stress if made from straight carbon steel. If, however, there were a 200-lb. load on the spring, resulting in 58,400 lb. per sq.in., the load would be just over the safe range for carbon steel, and the spring should be made of alloy steel. Were a 300 lb. load imposed, eventual failure would result, no matter what steel was used, but the failure, would be less rapid in the alloy steel than in the straight carbon steel.

The chart illustrated below shows more or less standard die springs. In this chart the deflection formula has been figured and placed in column *H*. The number of coils in the spring are not listed, but can be approximately found by dividing column *E* by the smaller dimension of the rectangular stock used. The carrying capacity compressed solid then becomes the product of column *F* multiplied by column *H*. This in turn can be calculated to the ultimate stress on the steel in the spring, and the proportional amount of deflection which a spring can safely stand is easily obtained. In event that it becomes necessary to compress the spring to a greater stress the user must expect breakage.

Abstracted from the "Art and Science of Spring Making" published by the Barnes-Gibson-Raymond Division, Associated Spring Corporation.

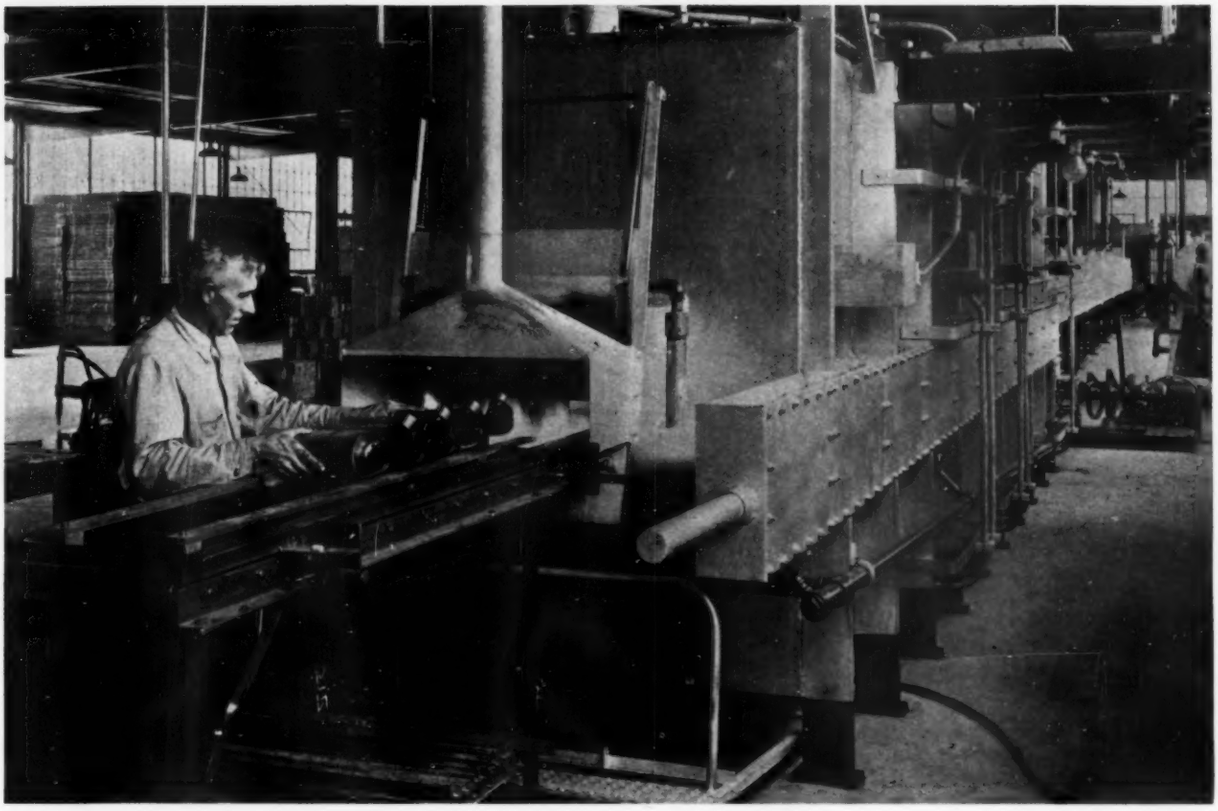
A	O.D. of hole in which spring will work
B	Dia. of rod over which spring will work
C	Free length
D	Size of steel
E	Maximum solid height
F	Total deflection
	Carrying capacity compressed solid = FH
H	Approximate load required to deflect one inch
J	Stress in lbs. per square inch for one lb. of load



Ends ground flat

	Type 1	Type 2	Type 3	Type 4	Type 5	Type 6	Type 7	Type 8
A	¾	⅞	1	1⅛	1¼	1½	1¾	2
B	⅜	⅜	½	9/16	⅝	¾	⅞	1
D	3/32 × 5/32	7/64 × 7/32	7/64 × 7/32	5/32 × ¼	5/32 × 9/32	3/16 × 5/16	3/16 × ⅜	7/32 × 7/16
J	940	544	649	305	292	231	225	161

DET	C	Type 1 E	Type 1 F	Type 1 H	Type 2 E	Type 2 F	Type 2 H	Type 3 E	Type 3 F	Type 3 H	Type 4 E	Type 4 F	Type 4 H	Type 5 E	Type 5 F	Type 5 H	Type 6 E	Type 6 F	Type 6 H	Type 7 E	Type 7 F	Type 7 H	Type 8 E	Type 8 F	Type 8 H
1	1	21/32	11/32	375				5/8	3/8	320	¾	¼	1600												
2	1½	29/32	13/32	270	⅞	5/8	736	⅞	5/8	346	1	½	1050	1 3/32	13/32	743									
3	2	1 5/32	27/32	190	1⅛	⅞	544	1⅛	⅞	270	1¼	¾	690	1⅜	5/8	610	1 5/16	11/16	773	1 5/16	11/16	610			
4	2½	1 13/32	1 3/32	150	1⅜	1⅛	416	1⅜	1⅛	192	1½	1	500	1 21/32	27/32	487	1⅝	⅞	600	1 9/16	1⅛	544	1⅝	⅞	768
5	3	1 23/32	1 9/32	120	1⅝	1⅜	352	1⅝	1⅜	160	1 13/16	1 3/16	460	1⅞	1⅛	390	1 13/16	1 3/16	578	1 13/16	1 3/16	416	1 29/32	1 3/32	620
6	3½	1 13/16	1 5/16	100	1⅞	1⅝	295	1⅞	1⅝	149	2 1/16	1 7/16	380	2 5/32	1 11/32	343	2⅛	1⅜	410	2 3/32	1 13/32	352	2 3/16	1 5/16	512
7	4	2 5/32	1 17/32	90	2⅛	1⅞	256	2⅛	1⅞	139	2 5/16	1 11/16	326	2½	1½	286	2⅜	1⅝	340	2⅜	1⅝	320	2 7/16	1 9/16	454
8	4½	2 7/16	2 1/16	78	2⅜	2⅛	210	2⅜	2⅛	122	2 9/16	1 13/16	310	2 23/32	1 23/32	252	2⅝	1⅞	306	2⅝	1⅞	272	2 11/16	1 13/16	416
9	5	2⅝	2 5/16	73				2⅝	2⅜	103	2 13/16	2 3/16	263	3 1/16	1 13/16	238	2⅞	2⅛	280	2⅞	2⅛	250	2 13/16	2 1/16	384
10	5½	2 11/16	2 5/16	63				3 1/16	2 7/16	249	3 5/16	2 1/16	216	3 11/32	2 3/32	216							3 7/32	2 9/32	336
11	6	3 5/16	2 13/16	58				3 1/16	2 13/16	90	3⅜	2⅝	230	3⅝	2⅜	210	3⅜	2⅝	220	3⅜	2⅝	235	3 7/16	2 5/16	302
12	6½													3⅞	2⅝	190							3 11/16	2 13/16	280
13	7													4 3/16	2 13/16	170				3 13/16	3 1/16	190	4	3	260
14	8							4 1/16	3 13/16	54	4⅜	3⅝	178	4¾	3¼	150	4⅜	3⅝	186	4⅜	3⅝	154	4½	3½	230
15	9							4¾	4¼	45							5	4	160				5	4	215
16	10													5⅞	4⅛	108	5½	4½	147	5½	4½	121	5½	4½	200
17	10½																						5¾	4¾	176
18	12																6¾	5¼	125	6⅜	5¼	102	6 17/32	5 13/32	150
19	14																						8	6	122
20	15																						8½	6½	112
21	16													9½	6½	72									



Tight, ductile seams are obtained on the Novi heater by brazing in a furnace with a total length of 90 ft.

Auto Heaters Furnace Brazed

BURNHAM FINNEY
Western Editor

ELECTRIC furnace brazing plays an important part in the manufacture of automobile heaters by the Novi Equipment Company. This company, which produces exhaust heaters for one of the country's largest car makers, has found that the brazing process results in an improved product and in lowered costs.

Brazing is done in a new General Electric 258-kw. roller-hearth electric furnace with a 20-ft. long heating chamber. The cooling chamber is 70 ft. in length. The relatively high temperature of 2050 F. is used to form heater cores which have sturdy, gas-tight joints, assuring the user long and dependable service.

The heater built by Novi is made of a drawn-steel shell. Over it are pressed punched steel fins; similar fins also are pressed into the shell. The shoulders on the fins assure their being uniformly spaced and provide good contact area between the fins and the shell. A suitable header is copper-brazed to the end and, in the finished heater, serves to conduct hot gases from the automobile engine to the inside of the steel shell.

The assembly of the shell and of the inner and outer fins is brazed in the copper-brazing furnace, after which a metal jacket is pressed into position around the unit. The jacket provides a duct through which outside air is circulated over the warmed heater core before it enters the car.

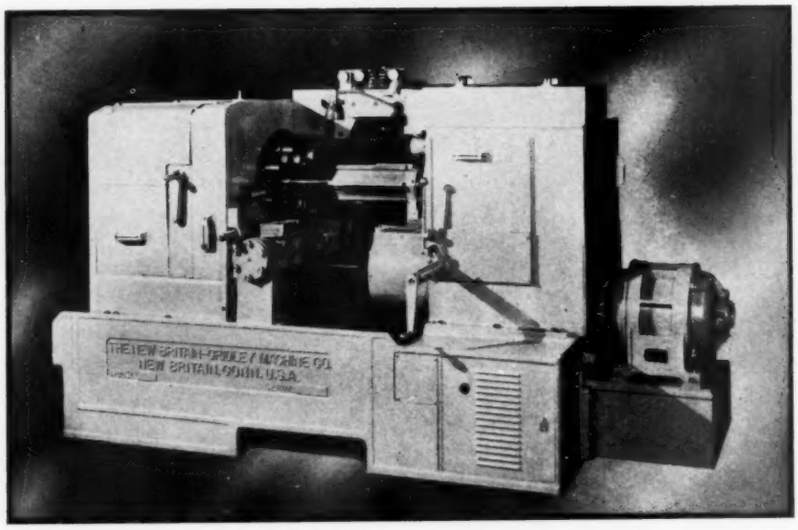
Unusual Temperature Control

There have been other installations of roller-hearth brazing furnaces, but the temperatures did not exceed 1950 F. A notable innovation in the furnace used by the Novi company is temperature control by lens-type radiation pyrometers. Leeds & Northrup "Rayotube" assemblies are employed instead of ordinary thermocouples. Their thermocouple elements are outside the furnace, being hermetically sealed in heads in which the temperature never exceeds 150 F. Thus the hot junctions of the systems are kept away from the heat and the reducing atmosphere within the furnace.

Heater cores are loaded on lightweight carriers so that there is the least dead weight to heat and so that replacement of the conveyor is minimized. In fact, any replacements are usually confined to the rolls in the hot zone. The ribbon-resistors in the furnace are comprised of 80 per cent nickel and 20 per cent chromium-alloy. Carriers are sent back from the discharge end of the furnace to the loading end on a gravity roller conveyor.

The furnace operation results in brazing more than 100 seams and joints. Straight copper wire, placed near the joints, acts as the brazing metal. The melted copper flows by capillary action in the furnace's controlled atmosphere, fusing the pieces together.

Shop Equipment News



Rotating tools can be used in all positions of the New Britain-Gridley Model 65 six-spindle chucking machine. Safety devices are interlocking

New Britain-Gridley Model 65 Six-Spindle Work-Rotating Chucking Machine

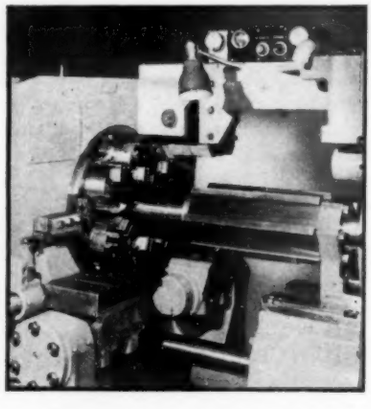
Especially developed for high-speed chucking jobs where six tooling positions can be used to advantage, the Model 65 New Britain 5¾ in. capacity, six-spindle, work-rotating chucking machine supplements the Models 14, 49 and 675 machines introduced some time ago. This machine can be equipped by the New Britain-Gridley Machine Division, The New Britain Machine Co., New Britain, Conn., with six 5¾-in. two- or three-jaw chucks or special fixtures to suit special jobs. Design follows the same box-type construction as the Model 61 automatic screw machine. Ample chip space and maximum tooling accessibility is provided, assuring ease of set-up and minimum maintenance time. Rotating tools can be used in all positions and threading or tapping attachments can be used in any or all of the last three positions.

Chucks are operated through a patented hydraulic system which provides adjustable chucking pressures wihin a range of 40 to 300 lb. per sq. in. Hydraulic chucking is operated in conjunction with synchromesh positive jaw clutches on the spindle.

Headstock and power box are bolted and doweled to the base, and both are tied together with a heavy-duty connecting member. The power box is entirely inclosed, automatically lubricated and all revolving shafts are mounted in anti-friction bearings. Provision is made for adjustment to the high- and low-speed clutches through sliding oil-tight panels.

The spindle carrier is of large diameter, with tool-slide stem forming practically an integral unit with carrier. Carrier is automatically lifted during indexing to eliminate wear on locating surfaces and is automatically clamped after indexing to eliminate weaving during the cutting cycle.

Spindles are short in length and are mounted in large diameter Radax-type bearings. Cross-slides are mounted on large-diameter circular studs and bearings are inclosed to eliminate the possibility of chips or grit working into the bearing surfaces. An extra slide, independently operated, can be applied in the No. 6 position if required. The hexagonal-shape tool slide is held in permanent alignment with the axis of the spindle. This slide is actuated forward and reverse with a drum-type cam, through roller and torque guide plates. Tool slide is equipped with adjustable stop for controlling lengths and depths of drill-



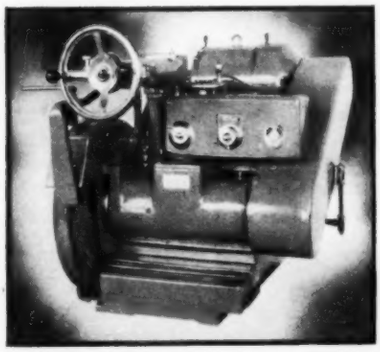
ing. Safety devices are interlocking to prevent power feed being engaged when hand feed is being used. A frictionally adjustable device operated through the main cam worm prevents damage to machine parts should a jam occur.

Drive is through a 20-hp., 1,200 r.p.m. motor mounted on a base at the end of the machine. Initial drive from the motor is through a silent chain, properly tensioned by an idler, to the main drive shaft.

Fitchburg "Bowgage" Grinding Head

Fitchburg Grinding Machine Corp., 76 Winter St., Fitchburg, Mass., is marketing the "Bowgage" independent wheelhead unit which is designed to replace wheelheads on grinding machines to adapt them for automatic cycle grinding. This is a self-contained independent grinding head unit having rapid traverse, slow grinding feed, grinding dwell or spark out and rapid return to starting position, all controlled by one pushbutton.

Rate of grinding feed is adjusted by a hydraulic metering valve



through a dial on the panel. Dwell time is governed by a clock-controlled time-delay switch. Another graduated dial, operated by a small handwheel, can be set for the amount of stock removal, with a maximum of ⅛ in. on the diameter.

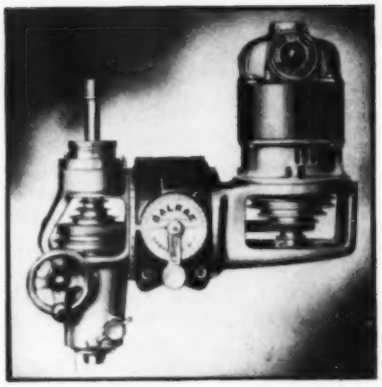
Wheel feed is obtained by a toggle action controlled by the movement of a leaf spring. Hydraulic flattening of the leaf spring by a vertical movement elongates the spring; this results in forward movement of the wheelhead. The head is built for either right- or left-hand wheel mounting and the unit can be mounted anywhere on the machine.

Specifications: wheel spindle diameter, 3 in.; rapid traverse movement, 0 to 5 in., fixed at the factory; automatic grinding cycle, adjustable from 5 sec. to 30 min.; motor required, 3 to 10 hp. depending on wheel size; weight, 1,650 lb., including 5-hp. motor. Grinding wheels 24 in. diameter by 2 in. face or 20 in. diameter up to 4 in. face can be used.

Dalrae Midget "Speedmill"

Boring, drilling and milling operations can be performed with the "Midget Speedmill" announced by the Dalrae Tools Co., Syracuse Bldg., Syracuse, N. Y. The high-speed spindle of this unit is housed in a hardened and ground quill which has a 2½ in. travel. Boring and drilling feeds are obtained with worm and worm-wheel. Smoothness of feeding action is claimed.

This unit retains the balanced design, flywheel type pulley, spindle lock, ejector rod, single mounting for any compound angle, self-contained



plumb bob and light weight of the standard Speedmill.

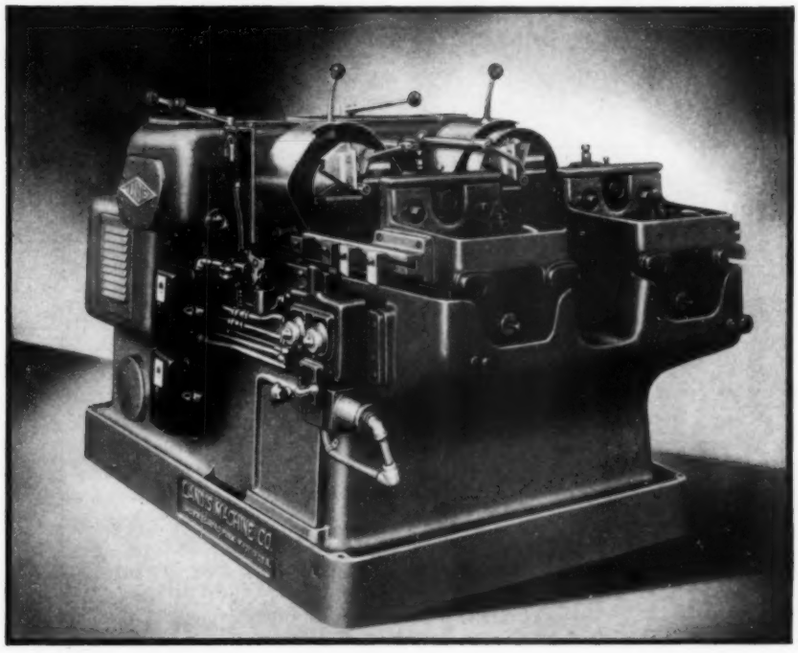
The usual solid depth stop is replaced by a stop that "clicks" a warning when the desired depth is reached. This eliminates cramping the precision ball bearing. A standard micrometer dial of large diameter is used for setting the depth stop.

"Lanhydro" Hydraulic Turning Machine

The "Lanhydro" hydraulically operated, double-spindle machine has been developed by the Landis Machine Co., Waynesboro, Pa., for turning operations. "Lanhydro" is a semi-automatic hydraulically controlled machine which completes an entire cycle automatically upon tripping a control lever. In appearance, this machine is similar to the "Landmaco" threading machine.

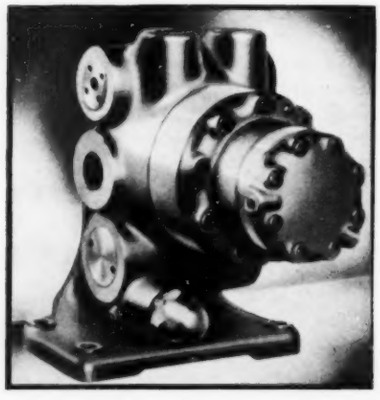
A special centering device supports the work during the turning operation. This unit consists of a female center backed up by a long spiral spring to maintain constant pressure against the work. The center travels back through the spindle with the advancement of the carriage. Concentricity between the head of the shaft and the turned stem is assured by using this traveling center to support the work.

The hydraulic unit and its control



valve have been specially designed for the machine. A rapid speed is provided to carry the work to the turning head. Upon reaching the turning head a coarse turning feed is used throughout the machining operation to a point within 0.008 to 0.010 in. of the shoulder. Where a shoulder must be faced, a very fine finishing feed is used. Length of travel of the finishing feed is adjustable for material or condition.

The carriage advances under a finishing feed to a definite stop. A variable dwell time is then provided for the final clean up and to make possible the holding of close limits in length from the end of the shaft to the face of the shoulder. Upon completion of the dwell, the turning head opens under hydraulic pressure and the carriage is rapidly returned to complete the cycle. It is claimed that very close limits can be maintained on diameters when the "Lanco" is used as a turning head. This head is readily adjusted to any diameter and is equipped with a micrometer graduation for accurate size changes. Four cutters are used, operating in the same plane in relation to the axis of rotation and against the shoulder of the cut.



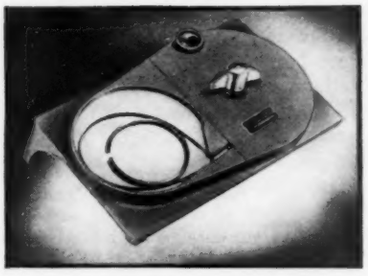
Sundstrand Model WX Hydraulic Pump Units

Model WX pump units, announced by Sundstrand Machine Tool Co., Harrison and 11th Sts., Rockford, Ill., are especially designed for arbor presses, clamping fixtures, indexing devices, clutches and brakes. These units are built in several sizes.

Quick action for the approach and return of a ram or clamping member is taken care of by a large capacity "Rota-Roll" pump with a small-sized pump of the same type producing the clamping or working pressure. All control valves for the two pumps are contained in the same housing as the two pumps. These valves are operated by a remote pilot valve which may be manually or automatically controlled. This arrangement reduces piping to a minimum and results in low power consumption, as only the small pump is operated at high working pressures.

Wilco Ring Gage

The Wilco ring gage, announced by Wilkening Mfg. Co., 2000 S. 71st St., Philadelphia, Pa., draws each ring against an angle which automatically maintains the same center line for all rings. Readings are made on a dial through a powerful magnifying glass and undersizes and oversizes are indicated in ten thousandths of an inch. The tape is made of Swedish steel and is fastened securely at each end to prevent stretching; adjustment is seldom needed. A master size ring



is furnished with each instrument so that the accuracy of a reading can be checked at any time. Adjustment of the dial is easily made, the scale being moved to the right or left until it shows the correct reading for the master ring.

Dial and all working parts of this gage are inclosed and the instrument is mounted on an inclined base so that it is convenient for the operator. This gage measures all rings from 2- to 6⅞-in. diameter.

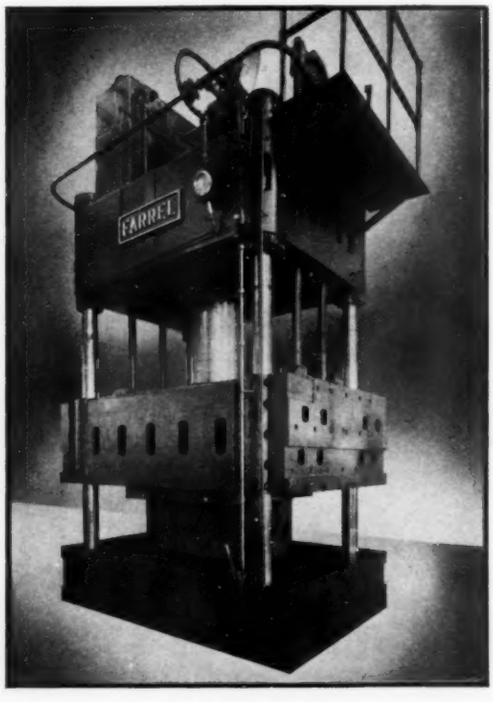
Farrel-Birmingham 500-Ton Hydraulic Metal Forming Press

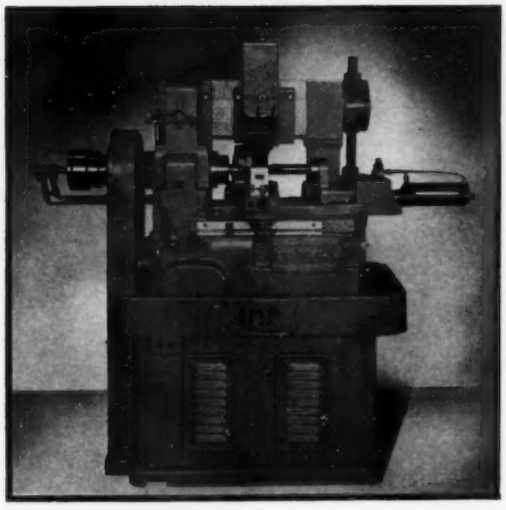
The hydraulic metal forming press shown in the accompanying illustration was built by Farrel-Birmingham Co., Inc., Ansonia, Conn., and installed in the plant of the Chance-Vought Aircraft Division, United Aircraft Corp., East Hartford, Conn. Maximum tonnage capacity of this press is 500 tons under a hydraulic pressure of 2,250 lb. per sq. in. on a 24 in. diameter ram.

Pump control is designed so that a wide range of hydraulic pressure may be obtained by a simple adjustment. Single-acting push-back rams raise the moving platen to open position. Push-back cylinders are of the outside packed type and require a minimum of maintenance.

Clear space between tierods is 61 in. wide by 90 in. long. Over-all dimensions of the bottom crosshead and of the moving platen are 80 x 126 in. The press has a maximum opening of 60 in., and a maximum stroke of 36 in. Closing speed is variable from 1 to 110 in. per min., and pressing speed ranges from 1 to 10 in. per min. Return speed of the press is 100 in. per minute.

Motor-driven pump equipment, which supplies the hydraulic piston, is mounted on top of the press. Pressure pump is of the radial type and has variable-pressure control. A 40-hp., 900 r.p.m. squirrel-cage motor drives the hydraulic pump.





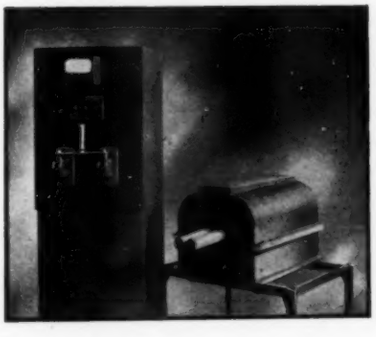
"Lo-Swing" Overarm Lathe Attachment

Seneca Falls Machine Co., Seneca Falls, N. Y., has announced a third slide or overarm attachment that is suitable for use with any of the new style "Lo-Swing Imp" lathes. Operation of this slide is synchronized with other turning and facing slides and is entirely automatic. It may be used for taking a finishing cut after roughing with tools on the rear slide or for chamfering and similar operations. The slide is heavy enough to be used for roughing operations, if desired.

Operation of the slide is by a cam on the main camshaft. Means are provided for quickly setting this cam, so that the slide may be timed to suit the particular job.

Ajax Induction Heaters

Recent applications of induction heating equipment installed by Ajax Electrothermic Corp., Trenton, N. J., include equipment for heating the ends of tubes prior to a series of forging operations and for heating an end section of a large steel tube prior to swaging. Equipment used for heating the steel tubes is shown in the accompanying illustration. A control panel is provided for each unit. High frequency power at 2,000 cycles is applied to the coil and in less than one minute 6-in. end sections of the two steel pipes are heated to 2,200 F., after which they are forged.



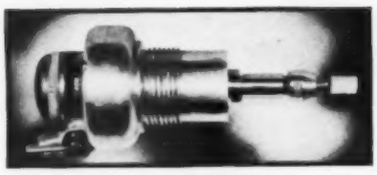
A special focus inductor coil on another unit is used to heat a narrow band at the end of these tubes following the forging operation and prior to a swaging operation. The narrow band at the end of the tube is also heated to 2,200 F. It is claimed that induction heating lends itself to efficient automatic control and temperatures can be held closely within desired limits.

Continental Type CE-868 Photo-Electric Cell

The Continental Electric Co., Geneva, Ill., has announced the Type CE-868 photo cell for industrial applications. This cell is 1-in. wide by 3 3/32-in. high and the active cathode surface measures 5/8x1 1/2 in. A standard 4-prong base is used. Operating voltage is 90 volts and average output is 50 to 80 microamperes per lumen.

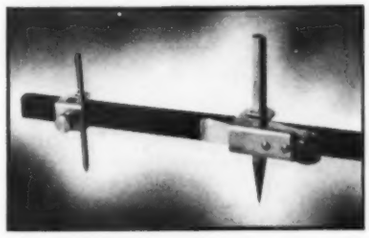
Onsrud No. MD-1 Turbine Grinder

The No. MD-1 air turbine grinder, previously described (*AM*—Vol. 79, page 189), manufactured by Onsrud Machine Works, Inc., 3921 Palmer St., Chicago, Ill., has been improved by changing the shape of the case. The case now fits conveniently into the palm of the operator's hand. This tool develops 1/4 hp., and 50,000 r.p.m. on 90 to 100 lb. air pressure. Lubricating system is of the centrifugal force type, the spindle being hollow and filled with oil. Centrifugal action feeds this oil through resistance elements to the precision ball bearings, insuring adequate lubrication when the tool is running, and none when it is idle. Bearings are cooled by expanded exhaust air and it is claimed that the tool will operate continuously at less than the temperature of the room in which it is used.



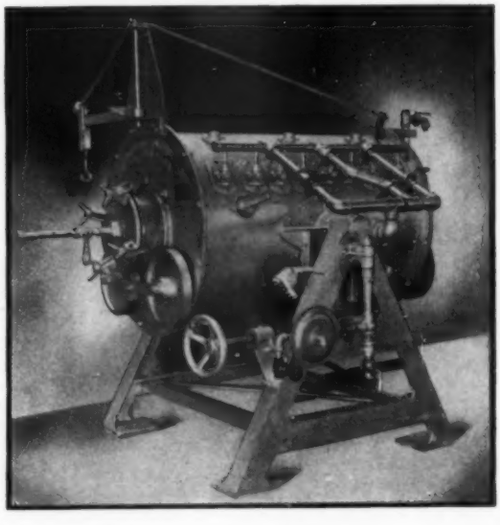
Bartusch "Perfect" Beam Compass

Any standard pencil or ruling pen can be used with the "Perfect" beam compass, manufactured by A. P. Bartusch, 775 Walnut St., Lockport, N. Y. Metal parts of this compass are of nickel silver. Radii as small as 1 3/8 in. can be ruled. Standard 12-, 24-, and 36-in. beams are made.



American No. 2-B-37 Rotary Carburizer

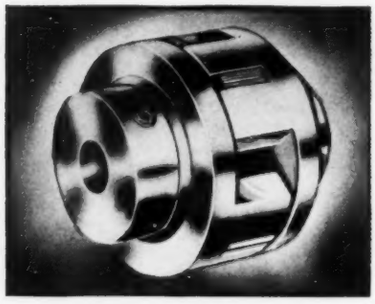
The American Gas Furnace Co., Elizabeth, N. J., has announced several improvements in the 600-lb. capacity rotary carburizer, which is now listed as No. 2-B-37. These improvements are claimed to give improved operating efficiency with reduced maintenance and inspection



costs, and with better product control.

Furnace lining consists of an insulating refractory backed by block insulation, which is claimed to give lower gas consumption. Burners are of heat-resisting alloy and fire into high-temperature burner tunnels. Burners and tunnels are easily removable for inspection or repair.

A flame which sweeps entirely around the retort with uniform heating at all points is secured by grouping burners at one side of the machine. Size of burners is graduated to insure uniform heating throughout the entire length of the machine.

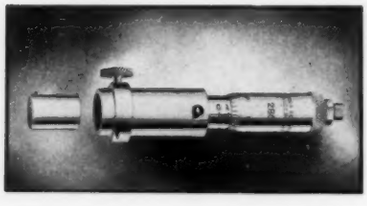


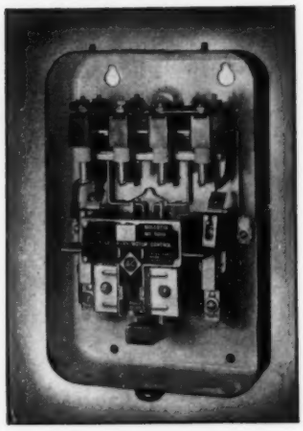
Waldron All-Steel Flexible Coupling

Recommended for use up to ¾ hp. at 1,800 r.p.m., the Francke all-steel, fractional-horsepower flexible coupling announced by John Waldron Corp., New Brunswick, N. J., can be used for shafts up to ¾-in. diameter. Independent lateral floating of the connected shafts is provided by this coupling. It is claimed to be silent at any speed.

B.&S. No. 280 Micrometer Head

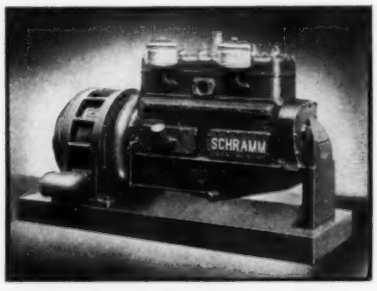
Micrometer attachment No. 280, offered by Brown & Sharpe Mfg. Co., Providence, R. I., widens the field of usefulness of end-measuring rods. The micrometer head has a movement of ½ in. and can be used with all lengths of ⅜-in. rods. With a ½-in. spacer plug this head permits inside measurements in 0.001 in. from ½ to 2½ in. longer than the end-measuring rod used. Measuring point is adjustable and has a locknut.





A.-C. "Ruptor" Motor-Starters

Type AP-7 across-the-line motor starters, announced by the Allis-Chalmers Mfg. Co., Condit Works, Boston, Mass., are equipped with inclosing chambers which confine and depotentiate the arc formed by circuit-interruption. These inclosing chambers are known as "Ruptors" and are claimed to increase the interrupting ability of the contact. The starters are furnished for 7½ hp. at 440 and 550 volts, 5 hp. at 220 volts, and 3 hp. at 110 volts.



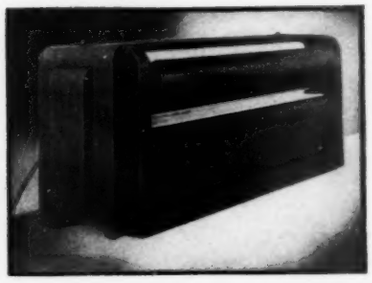
Schramm "Utility" Air Compressor

"Utility" compressors, offered by Schramm, Inc., West Chester, Pa., are especially designed for installation in industrial plants. Features include a new mechanical intake valve located in the compressor block and operated from the camshaft in perfect timing with the piston travel. Main bearings intersperse every cylinder so that four-cylinder models have five bearings and six-cylinder models have seven bearings. Force-feed lubrication is provided.

These compressors are offered for either V-belt drive or for direct coupling with an electric motor. Capacities offered range from 85 to 420 cu. ft. delivery per minute.

Bruning Model 3-BW Continuous Printer

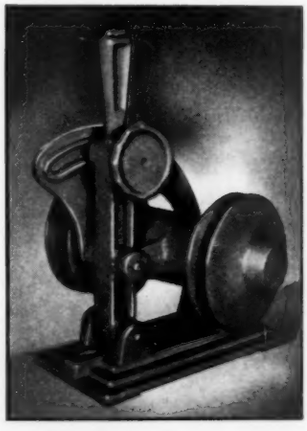
Used in conjunction with the Bruning black-and-white developing machine, the Model 3-BW printer announced by Charles Bruning Co., Inc., 102 Reade St., New York, N. Y., provides an inexpensive means of pro-



ducing black-line prints from tracings or drawings. It is claimed that paper exposed in the Model 3 printer can be developed and used immediately. Prints do not require washing or drying. Paper of any width up to and including 42 in. can be used and the unit can be operated from any light socket.

Columbia Vari-Speed "Hi-Eff" Control

"Hi-Eff" Vari-Speed Control, introduced by Columbia Vari-Speed Co., Wheaton, Ill., incorporates the adjustable V-pulley principle in a single shaft design. The transmission consists of a single shaft on which are mounted two adjustable V-belt



pulleys. These pulleys vary in diameter as their distances from the driving and driven pulley are changed.

Infinite speed selectivity within ratios of 5 to 1 are offered. Sizes ranging from ¼ to 7½ hp. capacity are available.

Mall Universal 1½-Hp. Flexible-Shaft Grinder

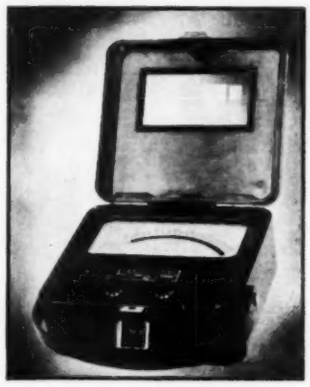
Mall Tool Co., 7740 South Chicago Ave., Chicago, Ill., has announed a 1½-hp. universal flexible-shaft grinder for general-purpose service. This tool operates at 9,000 r.p.m. at either 110 volt a.c. and d.c., or 220 volts a.c. and d.c. With this high speed a 4-in. wheel will accomplish the same results as an 8-in. wheel used on a slow-speed unit. This grinder is recommended for grinding weld seams, flat surfaces, surfacing and snagging castings, grinding stainless steel and other parts in metal-working plants.

Skilsaw 7-in. Disk Sanders

Two 7-in. disk sanders, one for heavy duty and one for constant production service have been announced by Skilsaw, Inc., 230 N. Michigan Ave., Chicago, Ill. These sanders are suitable for removing weld marks, rust and dirt from metal surfaces and for

sanding metals, smoothing steel and iron castings and seams and columns. Both models have aluminum-alloy bodies, die-cast in a smooth design. An air filter protects the commutator and motor from abrasive dust and dirt.

The heavy-duty Model G unit is 16¾ in. long and weighs 12½ lb. The continuous production Model L is 16¾ in. long and weighs 14 lb.



Bristol Portable Indicating Pyrometer

A millivoltmeter-type, portable, indicating pyrometer for measuring temperatures up to 3,000 F., has been announced by The Bristol Co., S. Main St., Waterbury, Conn. The high-resistance millivoltmeter movement is double-pivoted and is completely shielded to prevent the effects of stray fields. Molded bakelite case is of moisture- and dust-proof construction. Use of a cobalt steel magnet is claimed to increase sensitivity and make possible a wider scale for more accurate reading.

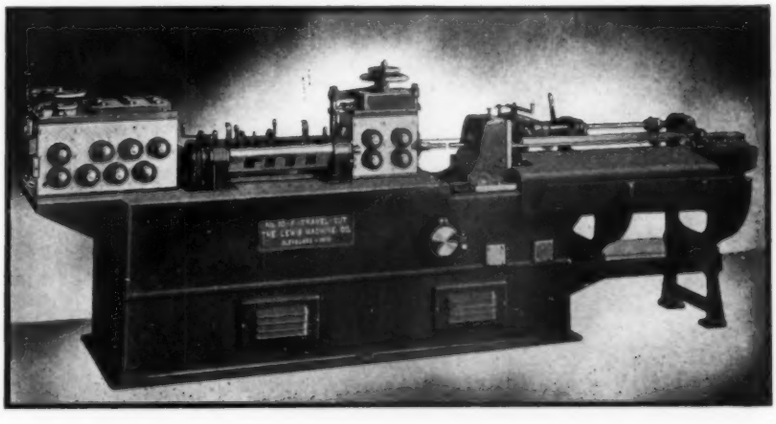
G. E. Size OO Magnetic Contactor

Size 00 a.c. multiple magnetic contactors developed by General Electric Co., Schenectady, N. Y., are designed for controlling small single-phase and polyphase motors, or for use as flexible relaying devices for comprehensive control systems. This contactor can also be furnished as a magnetic switch, mounted in a small sheet-metal case, which is suitable for general-purpose applications where atmospheric conditions are normal. The device, used either as a contactor or a magnetic switch, has a maximum rating of 10 amp. at 600 volts.

Lewis No. 10-F "Travel-Cut" Wire Cutting Machine

The No. 10-F "Travel-Cut automatic wire straightening and cutting machine offered by The Lewis Machine Co., 3441 E. 76th St., Cleveland, Ohio, has capacity for rod ranging from ⅜ to ⅝-in. diameter. Design is such as to give ample capacity for continuous service at its maximum capacity. Wire is fed from the coil, straightened, gaged to accurate length and cut on the fly. This method is claimed to assure uniform diameter rod throughout the entire length and produces a rod free from feed roll marks. Cutting of uniform lengths does not depend upon accurate engagement of the clutch or brake adjustment as the machine is designed to cut under all working conditions.

Cutting knife is operated by means of a quick-action cam on the flywheel shaft and the knife moves forward with the wire during the cutting operation. A roll straightener is provided



to remove the coil bow and rough straighten the wire before it enters the rotary straightener or flier. A standard five-die steel rotary straightener is used for the finish straightening operation. This unit is designed to take hardened iron, bronze, babbit or any type of straightener dies best suited for the wire to be handled. All main drive units are fully inclosed in oil housings, including the flywheel and clutch which are mounted in a closed housing and run in a constant bath of oil. Cut-off drive mechanism is completely sealed in the machine bed, and the cut-off cam and cut-off head drive run in oil. Net weight is approximately 15,000 lb.

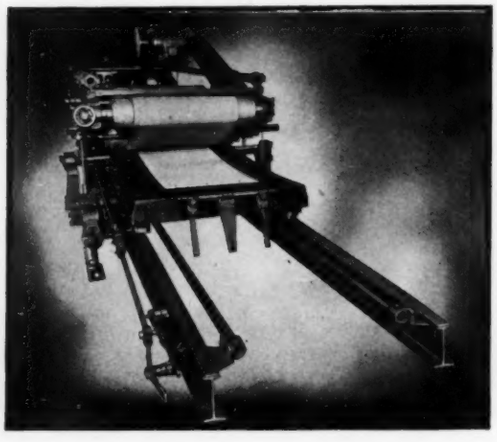
"Permocharts"

A recording meter chart for use in all cases where ordinary paper charts are destroyed after one day's use is announced by Permochart Co., Koppers Bldg., Pittsburgh, Pa. The smooth, hard-surfaced "Permochart" is made from a recently developed wrinkle-proof, waterproof, non-inflammable material which can be cleaned by the use of a damp cloth. It is claimed that tests have proved the charts effective for more than two years' service.

Excelsior No. 27-H Sheet Grinder

Excelsior Tool & Machine Co., Ridge Ave., and 32nd St., East St. Louis, Ill., have announced the No. 27-H automatic sheet grinding and polishing machine for finishing stainless steel sheets. This machine uses commercial abrasive paper in any width specified for 12 and 16 ft. endless belts. Design is heavy, for continued production without vibration.

The polishing head consists of two steel balanced pulleys with shaft supported on both sides in dust-proof ball bearings. A centrally located, flexible, rubber-covered pressure roll applies pressure to the grinding belt by gravity. Carriage is mechanically operated and is adjustable to any length sheet. A 3-hp. motor is used to operate the carriage and a 40-hp., 1,800 r.p.m. motor operates the grinding belt through a V-belt drive.



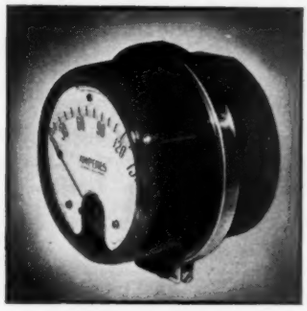
Clark Improved Tote-Pan Truck

The Clark tote pan truck, offered by All Steel Welded Truck Corp., Rockford, Ill., is now equipped with two vertical straps, is electric-welded throughout, and has two 6 in. diameter semi-steel wheels with roller bearings. This truck has a capacity of 1,000 lb. Single or nested pans can be picked up with the extended arms.

Westinghouse "Plug-in" Detachable Instruments

Sockets for detachable instruments announced by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., may be cut into the conduit or grouped in standard metal boxes to constitute a panel assembly. Sockets can be installed and sealed, providing convenient outlets for future installation of instruments or making connections possible for conveniently testing equipment at periodic intervals.

A detachable instrument consists of two main units, first a socket or mounting device which is provided with electrical connection jaws, and second, the instrument mechanism mounted on a plate having electrical connection blades on the back and inclosed in a waterproof housing of glass. The instrument unit



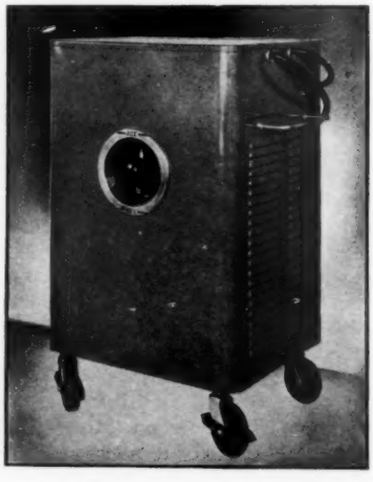
is arranged to be plugged into the socket automatically, completing all electrical connections between the jaws in the socket and the blades on the instrument.

Pier "Ace" Arc Welders

"Ace" arc welders offered by Pier Equipment Mfg. Co., 554 Cross St., Benton Harbor, Mich., feature a synchro-control which provides correct regulation of both current and voltage for each kind of material and rod size. This control comprises a special circuit and rotary switch whereby a single knob with calibrated dial is used to set the control for correct current and voltage.

Model 10 is suitable for production welding wih 5/32-, 3/16-, 1/8- and 5/32-in. coated electrodes. This unit is 15¼ in. wide, 14½ in. deep, and 24½ in. high. Weight without accessories is 225 lb. Capacity is 22 gage to ½ in. sheet metal with 150 amp. welding current for 1 hr.

Model 20 is capable of using 250 amp. continuously and uses 5/32-, 3/16-, 1/8-, 5/32- and ¼-in. coated electrodes. This heavy-duty model is suitable for welding up to 1 in. steel. It is 20 in. wide, 18 in. deep, and 33 in. wide. The net weight, without accessories, is 380 pounds.



Round Table

Play–With Pay

"Where are you going for your vacation this year, Ed?"

"Don't know that I'll be able to get away at all, Al. I'm very apt to have a busy summer, now that the new vacation-with-pay plan has been approved."

"So Williams finally won his point. I'm glad of that, his arguments are sound."

"Sound enough to disrupt our production schedules for three or four months every year, Al. I'm not sure that giving every workman a one or two week vacation is going to work."

"Naturally it won't if all of you don't get back of it."

"I know it won't, but what do you want me to do when the shop has a heavy schedule and I'm required to get along with one or two men off all through the summer?"

"Doesn't the approved plan provide that vacations are to be scheduled in such a way as to insure orderly operation of the plant?"

"Yes, the schedule for vacations is to be made up by the foreman of each department."

"Then you'll have to plan ahead to make sure you'll have men enough for each operation. By the way, is everyone eligible?"

"Everyone in the shop who has been on the payroll more than two years gets one week with pay and those having more than five years service are entitled to two weeks."

"That's the same allowance your office people have been receiving for a good many years. Both office and shop workers require relaxation in order to do their best during the rest of the year."

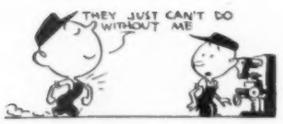
"But it really puts me in a tight corner. Production schedules have to be maintained whether we have men in the shop or not."

"Office work gets done, why won't the same be true in the shop?"

"I've a premonition that it won't be the same. It's going to be hard to get along without some of the key men in my department."

"Then you had better train a few men to step in and handle work regularly done by your key men. What's going to happen if one of those men decide to leave?"

"We'd have to replace him somehow—but what connection does that have with vacations?"



"At least vacations will show you that no one man is indispensable. Better arrange your schedule for the least interference with production and then train some men to fill in."

"Wouldn't it be better to shut the entire plant down for a week or two and let everyone have his vacation at the same time?"

"Several companies have tried that out to advantage, but others have found that it is too expensive to shut their plant down even for one week. This is particularly true in plants having continuous processes."

Is any shop man so indispensable that he should not be given a regular vacation? Can vacations be scheduled so as not to interfere with production?

Discussion

The Open Door

Al adopted a sound policy when he opened the door to any workman in his shop. Of course, there is a chance of wasting some time with certain types of men, but I think that Al can find a way to shut off the "shop lawyers" and gossips.

Some substitute for the open-door policy must be adopted in the larger plant, which has reached the point where personal contact with all the men is impossible. This substitute should be more effective than ordinary contact of the men with their foremen.

An executive officer should be detailed to handle these personal contacts during certain specified hours of each day. It is of the utmost importance that the right man should fill this position. I should prefer an elderly man who has come up through the shop. He should talk "shop language", be firm but tactful, and not arrogant or dictatorial.

If we had more men of this type handling labor relations, small grievances would not grow into labor troubles.

—Herbert M. Darling,
Superintendent,
Wells Tool Company.

The Open Door

The open door policy, like many other privileges, can be easily abused. Like a small boy with a new toy, the men are feeling their new-found power and are getting utmost satisfaction in exerting their privilege to complain concerning matters whether trivial or serious.

The policy of allowing the workers to bring their grievances to the foreman as soon as they wish to do so, instead of waiting until a certain scheduled time of the day, allows the men to get their troubles off their chests instead of giving them time to brood over the real grievance and add many imaginary ones to it. It also does not provide the opportunity for them to solicit sympathy from their fellow workers, which may get their friends into the turmoil.

—Robert Knotek,
Toolroom Foreman,
Fisher Body Corporation.

The seed which eventually sprouts labor trouble lies deeply buried and dormant long before employee discontent expresses itself in strikes. Talking with dissatisfied employees verifies this statement. They pour out all sorts of miscellaneous grievances. The damming up of these grievances gives them the emotional energy with which to respond to the organizer or agitator.

Opportunities should be created for employees to express their grievances. Through an open-door policy the air is cleared if the employee can talk to someone with some authority. Emotional pressure is kept at a normal level. All should be free to come to management for aid or advice. Management should always give them a hearing and always be impartial. The result will be exceptional freedom from personnel difficulties.

—Harry Kaufman,
Industrial Department,
Philadelphia Navy Yard.

Open House

I am strongly in favor of an open house *night* for family and friends and also of keeping the latch string out for visitors. It is in such manner that a firm becomes something of significance in the community and not just a place where Dad goes and comes home all tired out, because we have to eat.

Of course a certain amount of selection and care must be made in who may be admitted as visitors. Otherwise the thing might be overdone. This is, of course, up to the discretion of the management. I do feel, however, that all visitors should be escorted and that definite channels be outlined so that there is no interference with any work. Local visitors should be confined to certain periods, out of town visitors should be attended to as they arrive.

In a shop that is a showplace one is apt to find more contented men. If it isn't fit for visitors to see, then it had better be fixed up.

—O. W. Winter.

Run-of-Mine Mechanics

Executives who do not organize their work on lines that enable them to make use of available supplies of labor, will usually be found among those doing least to train suitable material to augment the present meager supply of first-class craftsmen.

The best way to make an asset of the below-average mechanic is by subdivision of operations, and the grading of labor according to the class of work they are fitted for. This grading would eventually raise the status of the craftsman, and at the same time give an incentive to the below-average men to fit themselves for the higher grades.

Under present conditions there are not sufficient inducements to make it worth while for many semi-skilled to qualify for transference to the ranks of skilled craftsman, as they would in many cases get a lighter pay envelope at the end of the week.

The only remedy employers seem to have for the second-rate mechanic is to put up with him as long as necessary and fire him when convenient. What effect this policy has on labor relations can be imagined.

—W. L. Waterhouse,
Hadfield, Bristol, England.

Shouting Foremen

Shouting foremen will not get the highest efficiency out of their men. The more people are driven, bullied or brow beaten the more they resent it and try to beat you. They will only do their rushing when you are standing over them. Any other time they are doing everything they can to beat you. Hatred grows and they would form or join anything to fight against you.

During the depression considerable imposition was handed out, people were in constant fear of losing their jobs. A great deal of the present labor trouble is the result of such conditions. In the present industrial situation all employers should instruct their subordinates in the true form of leadership and dispense with the bully. —H. A. Gilliland
Hamilton, Canada.

A foreman has a choice; he can be either just or unjust. But there is something more than this. A just foreman to be a success, must use tact and plenty of common sense. He can't let the men take advantage of him. He must have his convictions and the courage to stand by those convictions. Then the men will respect him. If he does the right thing as it is given him to see the right thing, the men will generally work with him to the limit.

It is the personal opinion of the writer that to be a good foreman, a man must know something more than machine shop practice—he must know human nature. I think the hell-raising foreman just advertises his own ignorance. He can't last. It's against the unwritten laws that govern our human emotions.

—Roger C. Dickey,
International Paper Box
Machine Company.

Tool Tickets

When a workman gets a tool with a check he can mishandle or damage the tool, and if this is not noticeable by the storeman he can get his check back and there is no record of his having had the tool. Undetected misuse of tools makes some men careless, and with the check system they cannot be found out. With a tool-ticket system a good deal of tool misuse would be prevented, as the man who had last used the tool can be quickly discovered. —W. E. Warner,
Sompting, Sussex, England.

The Conscientious Workman

A superintendent who has a man that can be depended upon can thank his lucky stars. There are altogether too many men of the other type.

Maybe it does cost more for the repairs but how about the other angle. Time is saved as there are fewer shutdowns, there is less loss of production and repair costs are lower. Then again, how about the peace of mind of the superintendent? He need not give a particular job such close supervision, nor wonder if the job is properly done. He can forget it and give his attention to other matters. The best work is always the cheapest in the end. —P. H. Pearson.

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Editorials

Wages and Hours Control —1937 Model

PRESIDENT ROOSEVELT has sent a message to Congress pointing out the need for federal control of wages and hours. A bill providing means for exercising this control has been introduced in the Senate by Senator Black, and in the House by Representative Connery. Let us pray that it is there for thorough consideration and adequate discussion before it is passed. We have had enough sad experiences with half-baked legislation.

In principle the bill is an attempt to establish a minimum hourly wage and a maximum work week that will serve as standards. The minimum hourly wage rate is to be written in by Congress, and the maximum work week likewise, but the administration will press for forty cents and forty hours. The bill also sets out to abolish child labor, its sponsors basing their hopes on recent Supreme Court decisions.

A board of five is set up to administer the act, and is given authority to modify existing standards and to establish new ones in special cases, after investigation and on the evidence produced at hearings. The board will function under the commerce clause.

Collective bargaining is protected, maximum overtime hours are to be set by the board, and "unfair" goods are barred from interstate transportation. The Connery bill covers imported as well as domestic goods, the Black bill does not.

If the objective is to abolish wage-cutting and outlaw chiseling no one can find fault with it. If, on the other hand, it essays to spread work, as Senator Black's thirty-hour bill did, then it should have few defenders. Our salvation does not lie in that direction.

As in any other piece of legislation of this type, the administration problem is staggering. Another federal bureaucracy seems to be unavoidable.

CONSIDERABLE discretion in setting wage and hour standards will have to be used by the board if it is to succeed. Certain industries are now mechanized to the point where their employees can earn much more than forty cents an hour, and can produce enough goods to meet the demand in forty hours each week. Other industries have not yet reached this stage of development.

Assuming that Congress will pass this bill, or something like it, because Mr. Roosevelt wants it, the best hope of those who have the future of the country and its industry at heart is for honest debate on the floors of both houses of Congress, and for fairly conducted hearings.

Security Upheld

As Its Last Important Act in a term that will go down in history as one of the most vital in the records of the Supreme Court of the United States, the Court has upheld the Social Security Act. The vote was 5 to 4 on unemployment insurance, 7 to 2 on old age pensions. State laws were also declared valid.

Efforts to revise the unworkable sections of the Act have been rather half-hearted pending the outcome of the cases before the Court. Now that the Court has spoken the first move should be to repeal the provision calling for a huge and unwieldy reserve fund, which was not one of the original features of the Security Act, and which is known to be unnecessary and unworkable. Ask any reputable expert on social insurance, here or abroad.

Senator Wagner is already on record as believing that the way is now open for much more far reaching social legislation than the Social Security Act. Perhaps it is, but let us make sure that what we have will work before we really let ourselves go.

After all, there are going to be other depressions, and there are going to be changes in the political complexion of the country. There may even be new labor leaders whose ideas will be different from those of the present incumbents.

Furthermore, a time is coming when a lot of bills will have to be paid by those willing to work and able to hold a job. Some people think that that time is at hand. Might it not be better to pay off these bills before obligating ourselves to pay a lot of new ones? There would be more security for most of us if we did.

CHIPS

WASHINGTON

Opponents of Roosevelt's court packing scheme gain hope as Judiciary Committee of the Senate votes 10 to 8 (or 5 to 4) against it and Justice Van Devanter announces his retirement at the end of the court term . . . Senate votes to make C.C.C. permanent but cuts director's salary . . . Roosevelt sends to Congress his wage and hour bill which is carefully drafted, has the support of labor and some industrial leaders, and calls for 40-hour work week with minimum wage of 40 cents an hour . . . Provisions for flexibility under direction of a board of five also included . . . Supreme Court finds Social Security Act constitutional . . . Congress has 29 amendments broadening the Act to consider, several million more people likely to be covered . . . House revolts and earmarks one-third of Roosevelt's relief bill, allots $300,000,000 to P.W.A. . . . Cabinet committee recommends export of excess helium for proper purposes.

FOREIGN

Soviet dictatorship finds its necessary to kill off a few more squads of "counter-revolutionists" . . . Nazi dictatorship having trouble with religious die-hards . . . Russian scientists and flyers establish base at the North Pole, have four men and a dog there . . . Mussolini against any truce in Spain until his legions have helped Insurgents win a conclusive victory, Loyalists take same stand but Germany is ready to aid peace plan . . . Stanley Baldwin retires after 29 years in British public life . . . Italian navy ready to operate outside Mediterranean . . . Polish Jews stage general strike in retaliation for discrimination . . . Paris exposition is opened but few of the buildings are finished and the turnstiles refuse to turn, labor troubles blamed . . . British imperial conference considers defense questions . . . Italian Jews ordered to support Fascism or leave Italy . . . U. S.-British trade treaty urged in House of Commons.

FINANCE

His budget upset by deficit in income tax returns Roosevelt demands a Congressional investigation of alleged tax avoidance by wealthy, most of them using entirely legal means under existing tax law . . . Revision of statute may be necessary to correct the situation.

INDUSTRY

Steel Workers Organization Committee wins Jones & Laughlin voting, thereby gaining privilege of exclusive bargaining for all employees, other independent steel plants likely to meet same reaction . . . Tear gas drives sit-down strikers from Thompson Products plant in Detroit . . . Yale & Towne announces permanent closing of Detroit plant employing 400 as result of raids by outside labor thugs . . . Utility strike cuts off current from homes, hospitals and plants in Flint, Saginaw and Bay City, and throws thousands out of work . . . U.A.W. rents two abandoned banks near Ford plant for strike headquarters as plans are drawn to force Ford into line, demands include 6-hour day and $8 minimum . . . A.F.L. leaders plan aggressive attack on C.I.O., call for doubled funds, accuse C.I.O. of "red" connections . . . Union signs agreements with Crucible, Allan Wood, and American Steel Foundries, similar to Carnegie-Illinois agreement . . . Strike closes Republic Steel plants . . . Also Youngstown Sheet & Tube plants . . . Iron and Steel Institute elects Girdler, Republic chairman, president . . . U.A.W. organizers beaten up at Ford Rouge plant gates as they try to distribute strike circulars . . . C.I.O. signs up with New York Interboro Subway receiver for closed shop and wage increase.

INDICATORS

Steel production maintained at better than 90 per cent of capacity . . . Electric power output gains a little . . . Business Week's index gains fraction of a point to reach 78.6.

Detroit Entertains Mechanical Engineers

Holley Medal presented to Henry Ford and honorary membership to Alex Dow . . . Harvey N. Davis nominated for president . . . Prominent speakers proclaim faith in industry and mechanization

911 members and guests of the American Society of Mechanical Engineers registered to make this year's semi-annual gathering at Detroit, May 16-21, one of the best in recent years. There was general approval of the program which threw the technical sessions into the afternoons and left the mornings and evenings clear for general sessions without conflict.

After explaining the plan of the program in his keynote speech, Dr. C. F. Hirshfeld, director of research, Detroit Edison Co., went on to give a picture of the automobile industry as it appears to one not connected with it but closely in touch with its development. "As I see it," he said, "mechanization and mass production afford the opportunity through which the wage earner can produce so much more per hour of labor that he can have more to use and to enjoy." Of the automobile industry he stated, "Its executives and managerial personnel do not believe that progress lies in the reduced content of the pay envelope and in longer hours of labor. They regard their job as the continuing development of better principles of management and production to the end that the pay envelope may bulge and that the number of available customers may be increased." His conclusion was, "I would rather live in the turmoil of competitive industry which has shown by its results that it does tend toward improved status of the mass than to accept the dead level of placidity that in theory at least results from governmental regimentation. I would rather give capital its small return while engaged in the task of making the wage earner also the capitalist than I would put capital goods, their ownership and their use, in the hands or under the complete control of even an ideally perfect government, to say nothing of real government as it has always been throughout the recorded history of the race."

Other addresses at the general sessions included an analysis of the adaptation of Timken bearings to railroad locomotives by T. V. Buckwalter and W. C. Sanders of that company, and a description of the equipment used for accelerated testing of railway motive power; an address on industrial research by C. F. Kettering, vice president, General Motors Corp., pinch hitting for President W. S. Knudsen who was forced to be absent at the last minute; a thoughtful paper on the interrelation of automobile shop practice and machine tool design by Fred W. Cederleaf, Ex-Cell-O Corp.; two papers on the economic principles involved in light weight, high speed train operation by Edw. G. Budd, president, and R. Eksergian, engineer, of the Edw. G. Budd Mfg. Co. In Mr. Eksergian's absence (he was getting a gold medal at the Franklin Institute) his brother who is chief engineer of the Budd Wheel Division of the company presented his paper; a paper on methods of control in the automobile industry by J. W. Scoville, chief statistician, Chrysler Corp., and one on decentralization of industry by W. J. Cameron of the Ford Motor Co.

The dinner speaker, Col. Willard Chevalier, vice president, McGraw-Hill Publishing Co., defended American business and industry and criticised the use of the two words production and distribution in conjunction. He insisted that our economy is a matter of exchange of production of goods and services, rather than production by some and distribution to others, and that so long as we keep that clearly in mind we shall continue to progress.

Technical sessions that attracted attention of the representatives of the metal-working industry who attended were the ones under the auspices of the Machine Shop Practice Division where papers on broaching and on industrial bearings were presented by Sol Einstein and Millard Romaine of the Cincinnati Milling Machine Co., and by A. B. Willi of the Federal Mogul Corp., respectively; and under the sponsorship of the Special Research Committee on the Cutting of Metals. At the latter session Charles J. Starr of the University of Illinois offered a paper on lip clearance on twist drills; Hans Ernst and Max Kronenberg of the research department of the Cincinnati Milling Machine Co., one on grinding of cemented carbide cutters; and R. C. Deale, supervisor of tools and apprentices, E. W. Bliss Co., summarized studies and experiments carried on under the auspices of the committee.

At the meeting the nominating committee of the Society reached agreement on the slate which is presented herewith.

A.S.M.E. Nominees

PRESIDENT

H. N. Davis
President, Stevens Inst. of Technology, Hoboken, N. J.

VICE-PRESIDENTS
(To serve 1 year)

F. O. Hoagland
Master Mechanic, Pratt & Whitney Division, Niles Bement-Pond Co., Hartford, Conn.

(To serve 2 years)

B. M. Brigman
Dean, Speed Scientific School, University of Louisville, Louisville, Ky.

Harte Cooke,
Mechanical Engineer, McIntosh & Seymour Corp., Auburn, N. Y.

W. H. McBryde,
Construction Engineer, San Francisco, Calif.

L. W. Wallace,
Director, Equipment Research, Association of Am. Railroads, Chicago, Ill.

MANAGERS
(To serve 3 years)

Carl Bausch,
Vice-President, Bausch & Lomb Optical Co., Rochester, N. Y.

S. B. Earle,
Dean, School of Engineering, Clemson A. & M. College, Clemson College, S. C.

F. H. Prouty,
Partner, Prouty Brothers Engrg. Co., Denver, Colo.

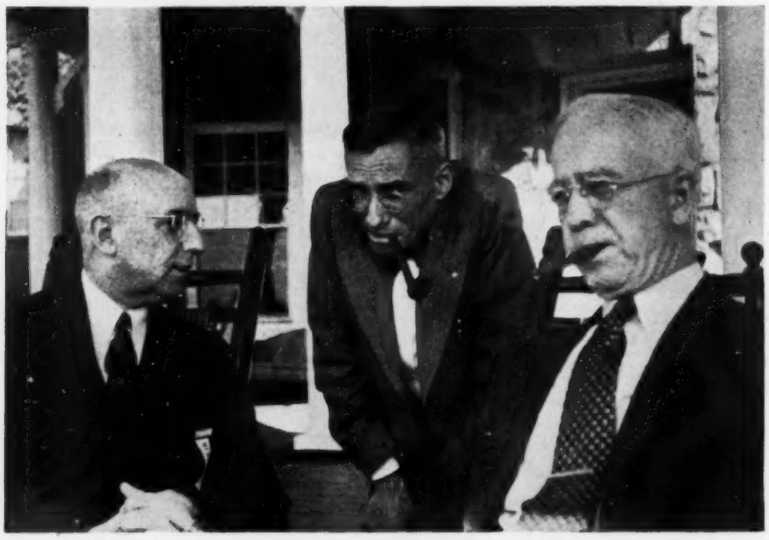
Presidential Nominee

Genthe

HARVEY N. DAVIS

H. H. Kerr Elected President of Gear Manufacturers' Association

WERNERSVILLE, PA.—High spot in the 21st annual meeting of the American Gear Manufacturers' Association, May 24-25, was the "coronation" of King Kerr. A mock ceremony, which included a convincing crowning, signified the passing of the reins of gear power from the able hands of Retiring President E. S. Sawtelle, Tool Steel Gear & Pinion Co., to those of H. H. Kerr, Boston Gear Works. Colorfully attired as befitting the occasion, the entourage of loyal subjects was led by A. A. Ross, G. E. Co.



A.G.M.A. President Kerr (left) makes plans for the coming year with R. B. Zerfey, Tool Steel Gear & Pinion Co., and B. F. Waterman, of Brown & Sharpe

The Association celebrated its coming of voting age by a highly successful gathering held at Galen Hall in the Blue Ridge mountains near Wernersville, Pa. Some 120 members and guests were on hand to attend the technical and business sessions.

Papers were presented by both the new and retiring presidents. Mr. Kerr spoke on "Wage Incentives" and Mr. Sawtelle on "Credit Unions" during a session devoted to problems of management.

Guest speakers contributed a valuable share of the program. A. M. Ondreyco, metallurgist, Mechanite Institute of America, read a paper "Gear Castings with Reference to Cast Iron" which had been prepared by O. Smalley, president of the same concern. This session was also addressed by H. F. Scratchard, industrial engineer, Birdsboro Steel Foundry & Machine Co., whose subject was "Casting Steel in Cement Bonded Sand Molds."

Neal Foster, Boston Gear Works, spoke on "Foremen and Foremen Training," and N. M. DuChemin, assistant manager, West Lynn Works, General Electric Co., presented "Some Problems of Management."

"Factors Influencing the Durability of Automobile Transmission Gears," was the topic of a talk by J. O. Almen, head of the Dynamics Department, Research Laboratories Division, General Motors Corp. S. L. Crawshaw, application engineer, Westinghouse Nuttall Works, contributed an address on "Application Factors for Helical and Herringbone Speed Reducers."

The Gear Geometry committee, of which A. H. Candee, Gleason Works, is chairman, recommended the use of a method of calculating gear-tooth caliper corrections substantially the same as that described by Nikola Trbojevich in *American Machinist* during 1931 (Vol. 74, page 573). Other chairmen reported on the status of the standards work in their committees.

New A.G.M.A. Officers

PRESIDENT

H. H. Kerr

President, Boston Gear Works

VICE-PRESIDENT

Howard Dingle

President, Cleveland Worm & Gear Co.

TREASURER

J. Harper Jackson

Jackson Gear Co.

MANAGER-SECRETARY

J. C. McQuiston

New Executive Committee Members

Howard Dingle

R. C. Ball

President, Philadelphia Gear Works

F. H. Drake

Johnson Gear Co.

U. Seth Eberhardt

Vice-President, Newark Gear Cutting Machine Co.

Howard Dingle, Cleveland Worm & Gear Co., relaxes a moment after his election as the association's vice-president

A treasurer's smile always reflects a good balance sheet; this one belongs to J. Harper Jackson, of the newly formed Jackson Gear Co.

WATCHING Washington

Court resignations and rulings main items of interest . . . Flood of suggestions for extending Social Security . . . Revolt on relief fund not well thought out . . . Army and Navy to revise mobilization plans . . . Dictators not available

WASHINGTON — Since President Roosevelt's Court packing scheme has served effectually to block practically all other proposed legislation in Congress during the current term the resignation of Mr. Justice Van-Devanter and the rulings of the Court on three Social Security cases have been the most important happenings in Washington during the past few days. Both sides in the controversy claim that these two events are going to be helpful to them but the matter is still shrouded in doubt. Many candidates for the Court vacancy have been nominated by the newspapers and by their friends, but the only one on which there seems to be any degree of unanimity is that of Senator Robinson. Both parties in the Senate have agreed that he would make an excellent appointee. Mr. Roosevelt is non-committal on the matter. Rumors are rife that at least two other of the older justices will retire shortly. If they do Mr. Roosevelt will have a chance to appease the Senate by appointing the generally conservative Robinson and balance that appointment by naming men of more liberal tendencies and fewer years for the other positions.

Security Extension

Upholding of the Social Security Act as being valid in its provisions for unemployment insurance, old age pensions and for legalizing state security laws cleared the air so far as this measure is concerned and loosed a flood of suggestions for extending the provisions of the Act. There is apparently considerable support for the move to include farm labor and domestic help under social security. At the President's press conference a week ago it developed that conversations on minor extensions of social security began last October, particularly with regard to extension of benefits for crippled and dependent children and widows. All of this costs more money. In December when the budget was under consideration it was decided that no extensions would be suggested to this Congress. It was thought best to see how the existing plan works, although the principal consideration was the question of money.

The revolt of House members that resulted in earmarking of about one-third of the President's $1,500,000,000 relief fund does not seem to have been very well considered. In view of the fact that $300,000,000 was allocated to PWA for projects that would look much more impressive in local communities than WPA projects do, aroused the suspicion that Congress has reverted to type and sniffs a pork barrel. The revolt will not offer much consolation to those who have been hoping that Congress would release itself from executive domination and act intelligently on its own hook.

Wage Differentials

The differential permitting lower wages in the South than in the North is the main stumbling block for the minimum wages—maximum hours legislation now being pressed by President Roosevelt. This difficulty will be surmounted—the legislation will be enacted—but there will be much more real interest in the differential than in the main question.

Little consideration will be given by Congress to what might be called the Tory arguments against it—that it is interfering with the law of supply and demand—that it will tend to force the United States to depend on its own market and thereby curtail world trade despite the efforts of State Secretary Cordell Hull to overcome trade barriers with his reciprocal trade treaties.

Note—these objections will be well considered in another way, however. They will in all probability force tariff revisions, or else a legislative attempt to bar foreign goods which are made under wage, hour, child labor or other conditions which would give the foreign "exploiters of labor" an unfair advantage over the legally restrained American employers.

Industrial Mobilization

Work is going ahead quietly in Army and Navy circles on a joint revision of the industrial mobilization plan. This revised plan involves the following principles: (1) decentralization of wartime munitions administration and production; (2) lighter loads on more manufacturers; (3) limitations of war profits to normal; (4) prevention of undue plant enlargement and its evils: and (5) quick adequate procurement in lieu of a large standing army.

Mr. Roosevelt still feels that the government must have the power to approve or veto any proposed plant expansions in industry. He thinks that one of the most vicious features of the present phase of the capitalistic system is that in good times there is terrific economic waste due to investment of capital in additional productive capacity which so frequently goes way beyond the consumptive capacity of the country for years to come.

Dictator Candidates

Ambassador Dodd's warning about a dictator prompted Senators and Representatives to look over the eligible list. They scratched off President Roosevelt. They, as politicians, are sure no one can overcome the aversion for a third term. John L. Lewis has the qualifications and the necessary ambition but there would be no chance for him to get Mr. Ford's backing. Huey Long and Henry Ford, it is admitted, would have made an ideal combination if they could have agreed upon a program but none of the self-nominated successors of Huey Long has gotten to first base. Rex Tugwell and Secretary Wallace are regarded as so communistic in their thinking that they would decline evin if nominated.

A dictator must be unscrupulous and full of bluff and bluster so that eliminates Newton Baker, Ogden Mills, James W. Wadsworth and others. In fact the opinion has been reached on Capitol Hill that there is a surprising shortage of dictator material in the United States at the present time.

National Metals Trade Group Re-Elects Officers

CHICAGO—To the accompaniment of news headlines announcing new strikes in Chicago steel mills, the National Metals Trade Association held its 39th annual convention at Chicago, May 27-28.

The guest speaker at the dinner meeting was Dr. Harold G. Moulton, Brookings Institution, who spoke on the effect of prices and wages on the American standard of living.

"The simple truth of the matter is that we have not reached a stage of technological development at which it is possible for the American people to obtain the standards of living they desire on a 40-hr. week basis.

"Enduring increases in the spread between wages and prices are contingent on progressive improvements in operating efficiency."

Charles H. Strawbridge, Goodman Mfg. Co., opened the convention by telling of N. M. T. A. facilities for aiding and promoting harmonious employee relations. David R. Clarke, Chicago attorney, interpreted significance of labor relations act and answered questions concerning it.

C. S. Craigmile, vice-president, Belden Mfg. Co., spoke on employers' responsibilities, particularly the need of fair dealings with workers. Dr. Samuel N. Stevens, Northwestern University, pointed out that the commodity theory of labor is obsolete today. Henry W. Johnson, vice-president, DeLaval Steam Turbine Co., described employer-employee cooperation and Lewis Ruthenberg, president, Servel, Inc., spoke on developing a community program. Apprenticeship was the subject of addresses by Howard Goodman, works manager, Goodman Mfg. Co., and Harry W. DeBruin, superintendent, The Jeffrey Mfg. Co.

Officers elected for the coming year were Charles H. Strawbridge, Goodman Manufacturing Co., president; N. W. Pickering, Farrel-Birmingham Co., Inc., first vice-president; A. H. Timmerman, Wagner Electric Corp., second vice-president and treasurer; George W. Cannon, Campbell, Wyant & Cannon Foundry Co., H. H. Kerr, Boston Gear Works, J. C. Nelson, Easy Washing Machine Corp., and T. H. Doan, The Foote-Burt Co., councillors.

Industrial Review

• ALTHOUGH several industrial centers report a slight falling off in activity during the last few days of the month, the total sales for May promise to be close to the high April level. The continuance of strike trouble is having a disturbing effect on business confidence but does not seem to be affecting sales of production machinery, probably because potential buyers look to plant modernization to offset higher labor costs and lowered efficiency.

• IN THE EAST, New England reports a very satisfactory May even though the April level was not reached, and expects a flood of business in June. New York reports no falling off in orders and continuing good prospects. Much the same story comes from Pittsburgh although here there has been a slight recession in orders. Cleveland is seething with labor unrest, practically every plant management having to spend a lot of its valuable time negotiating with this, that or the other union group.

• DETROIT SAYS that the machinery business quieted down toward the end of May but that important inquiries continue to pour in. Considerable business from the tool and die companies which are becoming very busy is expected shortly. Toledo comments on the continuing demand for machine tools and says that new programs are coming to light almost daily. Cincinnati machine tool builders are now placing shop orders for January and some of them report much lost business because of inability to deliver.

• IN ST. LOUIS the labor front is quiet, all of the major strikes having been settled with C.I.O. recognized for bargaining. May was somewhat quieter in orders and June is expected to be still more quiet. Opinions differ in Chicago. Some distributors report a reaction caused by strikes, others say that the high April level has been maintained. Small buyers seem to be more affected than larger ones. Milwaukee has been bothered by labor demands which have set business back all over the city and the surrounding industrial area.

• MACHINE TOOL orders slackened along the Pacific Coast during the last weeks of May but are maintaining a fairly even volume which continues well ahead of last year. C.I.O. vs. A.F. of L. competition for membership is said to have precipitated strikes which closed several machinery parts manufacturing plants in the San Francisco bay region. These disputes, however, have had no appreciable effect on the machinery business.

Warner & Swasey Surveys Skilled Labor Situation

A serious shortage of skilled labor is revealed by a survey recently conducted by the Warner & Swasey Co., Cleveland. The survey is based on replies to a questionnaire on the employment situation received from 229 concerns in a wide variety of important industries, employing a total of 791,820 people. 195 firms stated that they were experiencing a shortage of skilled labor and, particularly, of machine tool operators.

On the question of methods of training men, 133 firms employ and teach men in their own plants; 7 firms prefer joint training schools cooperatively run by industry; and 18 reported that they rely on trade and vocational schools.

Out of the number of firms reporting 182 stated that the men they had employed during the last two years had not come, to any great extent, from relief or public employment.

In commenting on the questionnaire, Phillip E. Bliss, president, stated steps must be taken to renew the supply of skilled labor and suggested that industry make a broader effort to try out men on relief and federal payrolls as well as untrained young men.

58th Annual Canadian National Exhibition

Preliminary plans and programs for the 58th annual Canadian National Exhibition held at Toronto, Ontario, Canada, August 27 to September 11, have been announced. One building on the grounds, supplying nearly 60,000 sq.ft. of exhibit space, is devoted exclusively to exhibits of electrical, construction, engineering and machinery equipment and supplies. It is expected that some 900 individual manufacturers will be represented with products of every description coming from Canada, the British Empire, the United States, and from many foreign countries.

Detroit LETTER

Dearborn holds center of stage . . . U.A.W. may demand closed shop of General Motors . . . Modernization will offset higher wages . . . Automatic transmission demand exceeds supply . . . Hupmobile plans new six and eight

DETROIT—The spotlight is on the fight of the United Automobile Workers to unionize the Ford Motor Co. Some companies may lie down and take it, but not Ford. Union officers realize that they have a man's size job cut out for them if they expect to take Mr. Ford into camp. They have planned a careful campaign over the next few months and boast that before the '38 season starts Mr. Ford's contract will be in the bag. However, they shouldn't be too sure. General Johnson and all of the Roosevelt contingent couldn't make Ford subscribe to N.R.A. and perhaps Henry Ford, even with the state and federal government cards stacked against him, is still more than a match for John L. Lewis.

Union Plays for Publicity

Union handbills which U.A.W. organizers Frankenstein and Reuther tried to hand out at the Rouge gates gave the tip-off that the U.A.W. will ask for a six-hour day and minimum pay of $8 a day. If the union seeks such a goal, its officers figure that when Mr. Ford grants a shorter work-day and higher minimum wages, it can claim the credit. The union also seeks to control the Ford production speed through supervision by union stewards, something which one cannot imagine that Mr. Ford ever would consent to. What the union is playing for at the moment is plenty of publicity for its Ford drive, and it seems to be getting it.

Union tactics are to snipe at Ford by causing trouble at branch assembly plants while pushing a membership campaign at Dearborn. Two short-lived strikes occurred recently at the Kansas City and Richmond, Calif., plants and last week the latter plant again was down. The real battle, however, will be at Rouge where 89,000 out of a total of 122,000 Ford men in the United States are concentrated.

"Quickie" sitdowns continue in General Motors. Saginaw has been the most troublesome spot lately, with two foundries and the Chevrolet parts factory affected. When the G.M. union agreement comes up for possible revision June 11, General Motors will demand a guarantee which will stick against production stoppages. Union officials have repeatedly warned against unauthorized sitdowns and even have gone so far as to call local leaders responsible for them "union enemies," but the situation obviously has been out of their control.

The U.A.W. unquestionably will seek from General Motors the right to be the sole bargaining agency for all the corporation's employees. Moreover G.M. officials wouldn't be surprised if the union asked for a closed shop and the check-off, using them for bargaining purposes. The U.A.W. also probably will demand a 90-cent-an-hour minimum and modification or elimination of the rule whereby new employees do not have seniority rights until they have been on the job six months.

Preparations for next year involve further expansion and modernization by the industry. Car makers aren't going to pay time-and-a-half for overtime if they can avoid it and therefore are enlarging their capacity to make more cars in less time. Fisher is to erect a new press room and die shop at its Plant 1 in Flint, giving it enough additional capacity to produce all the stampings needed for bodies built there. Thirty-five new presses have been bought and the new plant will have a total of 135 presses capable of stamping all sizes of body parts, including all-steel roofs.

This expansion at Flint is causing surprise after all the labor trouble there. However, the corporation probably realizes that it will have the labor problem with it no matter where it goes these days and, after all, centralized production is more economical than decentralized operations.

De Soto is adding about 15 per cent to its production of stampings by purchase of new presses. Work probably will be brought in from the outside. Midland Steel Products and Parrish Pressed Steel Co., Reading, Pa., have bought new equipment to take care of the Buick frame business for 1938. Heretofore Buick has secured frames from A. O. Smith. Parrish has built alloy steel frames for trucks and buses, but this is its initial venture into passenger car frames. It will supply the Linden, N. J., plant where Buicks will be assembled.

Pontiac Lifts Motor Capacity

Pontiac has spent $2,800,000 for new machinery for its motor plant and next year will have capacity for 350,000 cars annually. The expansion is almost entirely for the six. Chevrolet has bought some equipment to produce a new clutch at Flint. Lincoln has made purchases to widen its output of Zephyrs. Pierce-Arrow is said to be completing financing arrangements for machine tool replacements.

Incidentally the machine tool trade should keep its eye on Dearborn for possible development of a sizable buying program for the Rouge plant. General Motors is considering seriously construction of an engine plant in Australia for which machine tools would be bought in this country.

Initial orders for Oldsmobiles with the new automatic transmission at $80 extra are reported amazingly large. Only about 100 transmission units daily are being made for Oldsmobile at the Buick factory, so cars containing the new feature will be scarce for some time. Latest reports are that the Buick 40 will have this transmission as optional equipment next year, but it will not be available on the higher-priced models.

Hupmobile is spending $1,500,000 for new dies, for the rebuilding of old dies and for tools, jigs and fixtures. It will make a six and an eight priced competitively with the Packard six and 120 respectively. Probably in the next month it will begin manufacture of 1938 cars which will be announced about Aug. 1.

Machine Tool Dealer

WM. K. STAMETS

Wm. K. Stamets Celebrates 25 Years as Machine Tool Dealer

William K. Stamets, pioneer Pittsburgh machine tool dealer, and associates, celebrated the 25th anniversary of the founding of his business at a dinner held in Pittsburgh, May 29. "Bill", as he is popularly known throughout the industry, was honored by men from the manufacturers which he represents and by personal friends who have taken an interest in his work since its inception.

Mr. Stamets began his machine tool sales activities in Pittsburgh June 1, 1912, and now serves as exclusive representative for 25 companies. He also designs and builds special machinery for the metal-working industry, having organized an engineering department in 1918. A Cleveland office was opened in 1919.

Trade Association Directory

The 1937 directory of trade associations has been issued by the trade association section, Bureau of Foreign and Domestic Commerce. This directory is an improvement on the 1935 edition in that it is indexed by commodities and services and by cities. Associations of manufacturers listed number 1,800.

Lubrication Film Pre-View

The Socony-Vacuum Oil Co., Inc., held a pre-view of its new motion picture film entitled "The Inside Story" in New York City, May 25. The film shows how different types of lubricants act in the various mechanisms used in industry. Lubrication of cylinders, gears and bearings is shown in striking manner.

T. M. Girdler, President Iron and Steel Institute

NEW YORK—With strikes on their hands and rising costs in prospect, steel leaders took time out to attend the 46th annual meeting of the American Iron & Steel Institute in New York, May 27. They heard Representative Wright Patman, Texas, vigorously uphold and explain the Robinson-Patman Law. C. M. White, vice-president, Republic Steel Corp., and L. H. Burnett, vice-president, Carnegie-Illinois Steel Corp., outlined the advances in the steel industry, both in safety and in technical fields.

There were 2,000 reservations for the dinner at which Newton D. Baker, wartime Secretary of War, spoke on "Democracy in Industry." Clyde E. Williams, Battelle Memorial Institute, Columbus, received the annual medal of the Institute at this dinner for his work in metallurgy.

Officers elected for the coming year were T. M. Girdler, Republic Steel Corp., president; W. A. Irvin, United States Steel Corp., first vice-president; E. T. Weir, National Steel Corp., second vice-president; Harold Hughes, United States Steel Corp., treasurer; and W. S. Tower, executive secretary.

Franklin Institute Awards Medals to Men in Industry

Among those receiving the 1937 medal awards of the Franklin Institute of the State of Pennsylvania for scientific ingenuity and skill, invention and discovery, was Dr. Rupen Eksergian, E. G. Budd Mfg. Co. He received the George R. Henderson medal in consideration of his contributions to railway engineering and his accomplishments in the field of railway locomotive and car design.

Edward Longstreth medals were presented to Richard T. Erban, consulting engineer, New York, for the invention and development of the Transitorq; Harold Sinclair, director, Hydraulic Coupling & Engineering Co., Ltd., Middlesex, England, for the adaptation of the constant-speed Fottinger-type hydraulic coupling to the variable-speed requirements of industrial applications; and Herbert L. Whittemore, chief, engineering mechanics section, National Bureau of Standards, for his part in the development of the proving ring for calibration of testing machines.

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Ideal Commutator Dresser Co., Sycamore, Ill., has moved its New York office to 61 E. 11th St.

Belt Manufacturer

FRANK H. WILLARD

Frank H. Willard Dies, Graton & Knight President

Frank H. Willard, president, Graton & Knight Mfg. Co., belting manufacturer, Worcester, Mass., died at the Hahnemann Hospital in that city on May 25 after an illness of five weeks. He was 71 years of age.

Mr. Willard entered the employ of the company 52 years ago as a helper in the factory. He later became general manager and in 1926 was elected president.

Mr. Willard was active in educational circles having served as a member of the board of trustees of Northeastern University and a director of the Worcester Trade School.

He was the first president of the American Belting Association. He was vice-president of the National Association of Manufacturers and chairman of the Sole and Leather Division, Tanners' Council of America.

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EDWARD J. MEHREN has resigned as president, Portland Cement Association, in order to devote his time to personal interests. He was formerly editor, *Engineering News-Record*, and vice-president, McGraw-Hill Publishing Co.

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WILLIAM B. GRISWOLD, 66, superintendent of manufacturing, Underwood-Elliott-Fisher Co., Hartford, Conn., died May 17. Mr. Griswold began with the company 35 years ago and had been superintendent since 1927.

H. C. JEWELL, secretary and manager, Jewell Bros. Mfg. Co., Winsted, Conn., died May 19 at the age of 63.

A. E. White to Become Next A.S.T.M. President

A. E. White, professor of metallurgical engineering and director of engineering research, University of Michigan, has been nominated to succeed A. C. Fieldner, chief engineer, Experiment Station Division, Bureau of Mines, Washington, as president of the American Society for Testing Materials. H. H. Morgan, manager, rail and fastenings department, Robert W. Hunt Co., Chicago, has been nominated for vice-president.

G. B. Waterhouse Nominated for A.S.M. Presidency

The nominating committee for the American Society of Metals selected the following nominees for election to office at the National Metal Congress in Atlantic City, N. J., October 18-22.

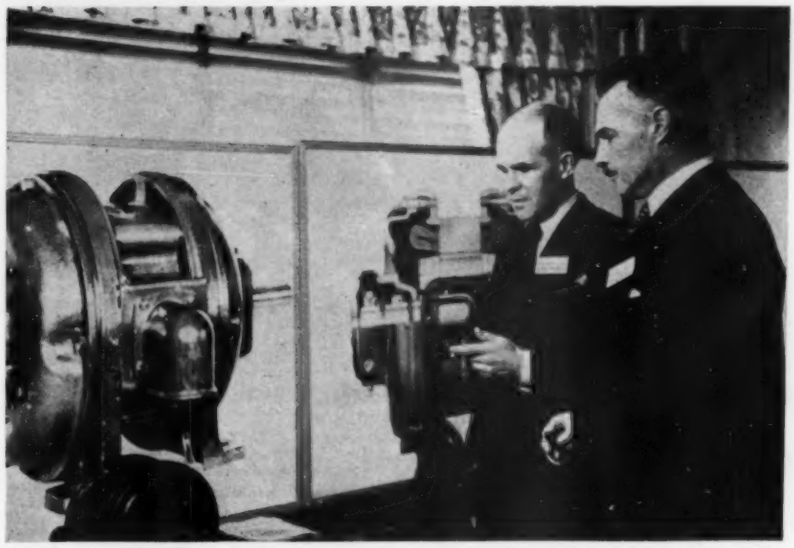
George B. Waterhouse, professor of metallurgy, Massachusetts Institute of Technology, as president, to succeed Edgar C. Bain, assistant to vice-president in charge of metallurgy and research, United States Steel Corp. Others nominated were W. P. Woodside, vice-president, Climax Molybdenum Co., for vice-president and Dr. Bradley Stoughton, dean of engineering, Lehigh University, for treasurer. Nominees for the office of trustee for two years are: Harvey Anderson, metallurgical engineer, Western Electric Co., and James P. Gill, metallurgist, Vanadium-Alloys Steel Co.

Carboloy Grinding Film

Carboloy, Inc., Detroit, Mich., reports that up to May 1 representatives of 170 firms had seen its recently released sound slide film showing rapid technique for grinding Carboloy Tools. The firm will make the film available to engineering societies, foreman's clubs, purchasing agents' associations, and other plants interested. Requests for this film may be addressed to the Carboloy Company, Inc., 2989 East Jefferson Ave., Detroit, Mich.

Titanium Carbide Picture

"Manufacture and Use of Cemented Titanium-Tungsten Carbide Tips and Tools in High Speed Cutting of Steel and Cast Iron," a sound motion picture made abroad under the direction of Dr. Ing. Paul Schwarzkopf, president, American Cutting Alloys, Inc., was first shown in Philadelphia May 13.



Henry K. Spencer, Blanchard Machine Co., and Norman D. MacLeod, Abrasive Machine Tool Co., were among those registered at the General Electric Machine Tool Speed Show held in Worcester, Mass., May 17. Delegates from as far away as Philadelphia and Buffalo attended the meeting

General Electric Puts on Show for Machine Tool Builders

Demonstrates how modern electrical equipment increases capacity, decreases maintenance and over-all costs

More than 125 representatives of leading eastern machine tool builders met at the Hotel Bancroft in Worcester, Mass., on May 17 to attend the Machine Tool Speed Show sponsored by General Electric. Design and application of motors and controls for machine tools were discussed. The part played by electrical equipment in increasing machine capacity, decreasing both maintenance and over-all costs, and in increasing ease of operation was stressed throughout the discussion.

Principal speakers and their subjects were: A. A. Merry, Carboloy Company, "High Production Performance with Carboloy Tools"; A. C. Danekind, General Electric, "Requirements of Electric Equipment for High Production Machine Tool Performance"; R. S. Walsh, General Electric, "Meeting Your Requirements for Motors"; and N. L. Hadley, General Electric, "Industrial Control to Meet Modern Machine Tool Standards."

Clayton R. Burt, president, National Machine Tool Builders' Association, and Prof. H. E. Edgerton, Massachusetts Institute of Technology, were the principal speakers at the dinner held after the discussion sessions. Mr. Burt reviewed the history of the machine tool industry and discussed the effect of this industry on the standard of living in the United States. Moving pictures taken at high speeds were shown by Prof. Edgerton.

Carborundum Band at Great Lakes Exposition

The Carborundum Band, under the direction of Edward D'Anna, which has been heard on the radio for the past eleven seasons, is to play two concerts on the afternoon and evening of July 24, which will be known as Carborundum Day, at the Great Lakes Exposition at Cleveland. It is expected that one or perhaps both of the programs will be broadcast and Francis C. Bowman, advertising manager, Carborundum Company, will be at the microphone. Dr. Frank J. Tone, president, and Mr. Bowman will be honored at a luncheon prior to the broadcast.

Billion Tons of Steel

The total tonnage of steel in use in this country, in all forms, has topped the one billion-ton mark for the first time in history according to the American Iron and Steel Institute. The total represents an average of 17,800 pounds in use for every person in the country.

M.T.I. Midwest Section Inspects Eastern Plants

Sixteen men connected with the Midwest Section, Metal Treating Institute, joined in a barnstorming tour to eastern commercial heat-treating plants, May 9-18. The purpose of the trip was to become familiar with member plants, their methods and personnel. Side trips were taken to large establishments such as Ford, Bethlehem Shipbuilding Co.'s Fore River plant, Pratt & Whitney Aircraft, and Wright Aeronautical Corp.

The good-will trip afforded members of the Institute an opportunity to discuss problems of mutual interest to commercial heat-treaters in the East and Midwest, the main centers of the business. They also joined in a regional meeting of the American Society of Metals at Newark, N. J.

Front row, left to right—Charles I. Wesley, Wesley Steel Treating Co., Milwaukee; Rudolph Thurner, Thurner Heat-Treating Co., Milwaukee; A. N. Lindberg, Lindberg Steel Treating Co., Chicago; William H. Walters, Acme Steel Treating Co., Detroit; K. Stumpf, Stanley P. Rockwell Co., Hartford; Herbert Schachter, Accurate Steel Treating Co., Chicago; E. C. Kohler of Lindberg; Roy M. Spindler and Joseph Husek of Wesley.

Second row—Melvin Kesting of Wesley; Clifford Scott of C. U. Scott & Son, Rock Island; Otto Muehlemeyer, Rockford; C. W. Derhammer, Lakeside Steel Improvement Co., Cleveland; C. H. Stevenson of Lindberg; Si Edwards, Industrial Steel Treating Co., Oakland, Calif.; H. R. Le Grand, American Machinist; John O. Hulting and Don Petersen, Perfection Tool & Metal Heat-Treating Co., Chicago.

The itinerary covered Detroit, Cleveland, Boston, Hartford, Newark, New York, Elizabeth, N. J., Philadelphia, and Cincinnati.

BUSINESS ITEMS

Frigidaire Division, General Motors Corp., within the next few weeks will begin the erection of two new factories and the enlargement and rearrangement of the Moraine City, Ohio, factory in preparation for 1938 production activities.

Reed-Prentice Corp., Worcester, Mass., has appointed F. W. McINTYRE, JR., as sales representative in the New England territory.

Boston Gear Works has appointed H. L. DICKIE, 314 36th St., Brooklyn, as distributor.

Vickers, Inc., Detroit, manufacturers of hydraulic pump valves and variable-speed transmissions, has become affiliated with the Sperry Corp., New York. HARRY F. VICKERS is president.

W. A. Jones Foundry & Machine Co., manufacturer of speed reducers, gears and transmission appliances, has moved its Buffalo, N. Y., office to 361 Delaware Ave.

Baldwin-Duckworth Chain Corp., Springfield, Mass., has appointed Olmsted-Flint Corp., Main & Portland Sts., Cambridge, Mass., to act as Boston distributor.

Reed-Prentice Corp., Worcester, Mass., announces the appointment of J. L. Osgood Machinery & Tool Co., 43 Pearl St., Buffalo, N. Y. as exclusive agent in that territory.

The Ex-Cell-O Aircraft & Tool Corp., Detroit, has amended its articles of incorporation changing its name to Ex-Cell-O Corp.

Nash Motors Division, Nash-Kelvinator Corp., will spend $1,500,000 this summer in modernizing plants at Kenosha, Racine and Milwaukee.

Chrysler Corp. has purchased the Davis Building, unit of Haynes Automobile Co., Kokomo, Ind., which will be remodeled into a plant for the production of transmissions and axle shafts. The plant will employ about 1,000.

Consolidated Machine Tool Corp., Rochester, N. Y., manufacturer of heavy machine tools, has opened an office in the Hudson Terminal Building, New York City, has appointed ALBERT MEYERS as representative in the New York teritory. An office has also been opened in Philadelphia, with ROBERT L. ARMS, 105 Los Angeles Ave., Fox Chase, as representative.

Marion Craftsman Tool Co., Marion, Ind., is to be reorganized as the Marion Tool Corp.

N. A. Strand & Co., Chicago, manufacturers of flexible shafts and machines, announce that Williams & Wilson, Ltd., are their exclusive agents for the provinces of Quebec, Ontario and the Maritime Provinces. Stock of machines and equipment will be carried both at Montreal and Toronto.

Wickwire Spencer Steel Co., was reorganized on May 1st with the following officers: E. C. BOWERS, president; P. M. MACKLIN, executive vice-president; R. L. FOSTER, vice-president and general sales manager; and GEORGE H. CREVELING, secretary-treasurer.

The American Steel & Wire Co. has created a new central metallurgical department which will coordinate and assist the district metallurgical departments. The new department is headed by J. S. RICHARDS, formerly director of manufacturing practices. C. W. MEYERS will act as assistant manager.

PERSONALS

J. P. HEIL, president, Heil Co., has been elected president, Jambor Tool & Stamping Co., Milwaukee.

WILLIAM BARNES, formerly assistant master mechanic, Jefferson Ave. plant. Chrysler Corp., is sales engineer, Welker Machinery Co., Detroit.

CLAYTON R. BURT and Mrs. Burt sailed May 21 on the S. S. *Bremen* for Europe.

C. B. SIMMONNS, Bristol, Conn., is now works manager, Sessions Clock Co.

E. B. EVLETH has been appointed vice-president and general manager, Brown Instrument Co., Philadelphia. He was formerly resident vice-president, Minneapolis-Honeywell Regulator Co.

Chief Engineer

Spellman

HARRY M. WHITTAKER

Harry M. Whittaker has been selected as chief engineer, Micromatic Hone Corp., Detroit. Mr. Whittaker will have complete administration of the company's engineering design and sales engineering work. He formerly was associated with Ex-Cell-O Corp., and until recently was head of the Whittaker Engineering Co., Detroit.

PHILIP P. EDWARDS has become affiliated with the Ingersoll-Milling Machine Co., Rockford, Ill. He was formerly vice-president of the Kearney & Trecker Corp., Milwaukee.

A. F. RIEBANDT has been named vice-president of the Waukesha Tool Corp., Waukesha, Wis., manufacturer of reamers. He was formerly superintendent of the National Tool Works, Cleveland.

C. G. TAYLOR and W. C. YOUNG, president and executive vice-president, have formed the Taylor-Young Airplane Co. The company will assume the business of the Taylorcraft Aviation Co., Alliance, Ohio.

HAROLD B. BERGEN has resigned as director of industrial relations, the Procter & Gamble Co., to become associated with the management engineering firm of McKinsey, Wellington & Co. Mr. Bergen will be in the New York office, in charge of the personnel management and industrial relations counseling service.

FORD LAMB, past president and one of the founders of the American Society of Tool Engineers, 31 Melbourne Ave., Detroit, has been appointed executive-secretary.

GEORGE MACNOE has been elected president, Foster-Wheeler, Ltd., St. Catherines, Ont., Canada. JOHN PRIMROSE is the new vice-president.

C. C. JORDAN has been appointed assistant manager, steam turbine division, Allis-Chalmers Mfg. Co., Milwaukee. Mr. Jordan has been with the company since graduation from Purdue University in 1923.

W. G. HULBERT has been appointed general works manager in charge of manufacturing, Easton, Pa. and High Bridge, N. J. plants, Taylor-Wharton Iron & Steel Co. H. F. HEYL, succeeds him as superintendent at Easton.

B. W. NORTON is now assistant manager, Youngstown district, Republic Steel Corp., says R. L. LEVENTRY, recently appointed manager. F. C. SHARRELL is now assistant district manager, Warren-Niles plant, of which FRANK E. FLYNN was recently named district manager.

CHARLES MERRITT YOUNG was elected president and general manager of the L. A. Young Spring & Wire Corp., Detroit. He has been connected with the company for eleven years, having served in various departments of the factory. Mr. Young has served as treasurer and vice-president since 1935. L. A. YOUNG continues as chairman of the board.

JOHN L. COTTER has been appointed secretary and treasurer, Hupp Motor Car Corp., Detroit. Mr. Cotter was formerly vice-president and general manager of the Crittall Manufacturing Co. of Detroit and Washington.

OBITUARIES

Merton C. Robbins Was Trade Journal Publisher

Merton C. Robbins, founder and president, Robbins Publishing Co., New York, died May 20 of heart disease. He was 62 years old.

Mr. Robbins was graduated from the University of Vermont in 1898, and started as western representative, in Chicago, of "Engineering News." In 1907 he became vice-president and western manager of "The American Architect and Municipal Journal." From 1910 to 1918 he was general manager of "Iron Age" and associated publications. He left that position to purchase "Gas Age" and "Brown's Directory of American Gas Companies," founding the Robbins Publishing Company. "Advertising and Selling," "American Printer," "American Perfumer," "Gas Age Record and Natural Gas," "Gas Appliance Merchandising," "Industrial Gas" and "Brown's Directory" are other publications of the company.

Publisher Dies

MERTON C. ROBBINS

Mr. Robbins was one of the founders of the Audit Bureau of Circulation. He was president of the New York Business Publishers Association from 1915 to 1916; president, the Associated Business Papers, Inc., 1920-1921, and a director of the National Publishers Association. For the past sixteen years he has been a trustee of the University of Vermont.

R. M. Heinrichs, Westinghouse Air Brake Official, Dies

Robert M. Heinrichs, vice-president, director and general manager, Bendix-Westinghouse Automotive Air Brake Co., Pittsburgh, Pa., died May 18, following an operation for appendicitis. Mr. Heinrichs was 37 years old.

Following his graduation from the University of Illinois in the year 1922, Mr. Heinrichs entered the employ of the Bendix Aviation Corp. In 1930 he was made general manager of the company, a mutual subsidiary of the Westinghouse Air Brake Co., and the Bendix Aviation Co. He served in this capacity until recently, when his appointment as vice-president and director was announced.

JOSEPH WILLIAM BOWMAN, president, American Steel Band Co., president, Bowman Supply Mfg. Co., and vice-president, Bostwick Steel Lathe Co., died recently. Mr. Bowman was a veteran steel manufacturer having operated in Pittsburgh since 1889.

GEORGE A. RHOADS, senior partner, J. E. Rhoads & Sons, Philadelphia, Pa., died may 8. Mr. Rhoads had been a member of the firm since 1888.

MEETINGS

AMERICAN ELECTRO-PLATERS' SOCIETY. Twenty-fifth Annual Convention. June 14-17. Hotel Pennsylvania, New York. HENRY A. PAINTER, secretary, Berkley Blvd., Iselin, N. J.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Summer Convention. Milwaukee, Wis. June 21-25. H. H. HENLINE, secretary, 33 West 39th St., New York, N. Y.

AMERICAN SOCIETY FOR TESTING MATERIALS. Annual meeting and exhibit of testing apparatus and related equipment. Waldorf-Astoria Hotel, New York. June 28-July 2. R. E. HESS, assistant secretary, 260 So. Broad St., Philadelphia.

ASSOCIATION OF AMERICAN RAILROADS, MECHANICAL DIVISION. Annual meeting, Municipal Auditorium, Atlantic City. June 16-23.

ASSOCIATION OF MACHINE TOOL DEALERS. Annual Convention, Skytop, Pa. June 14-15. JOHN SAUER, JR., Peninsular Machinery Co., 2921 E. Grand Blvd., Detroit, Secretary.

ECONOMICS CONFERENCE FOR ENGINEERS. Seventh Annual Convention. Stevens Engineering Camp, Johnsonburg, Warren County, N. J. June 18-26. PRESIDENT HARVEY N. DAVIS, Stevens Institute of Technology, Hoboken, N. J.

RAILWAY SUPPLY MANUFACTURERS ASSOCIATION. Exhibit and meeting in connection with Association of American Railroads, Mechanical Division. Municipal Auditorium, Atlantic City. June 16-23. J. D. CONWAY, secretary-treasurer, 1941 Oliver Bldg., Pittsburgh, Pa.

EXPORT OPPORTUNITIES

* Interested American firms and individuals may obtain the names and addresses of the foreign firms making these inquiries upon application to the Bureau of Foreign and Domestic Commerce, U. S. Department of Commerce, Washington, or any district or cooperative office. Please refer to key number.

Dairy and canning industry machinery. (Agency.) Buenos Aires, Argentina. *3184.

Machine tools, such as lathes, and drilling, milling, planing, shaping, plotting, grinding, and gear-cutting machines; pharmaceutical machines; material-testing machines; steam and pneumatic hammers; flour milling machinery; oil mill machinery, cranes, turn tables for locomotives, and dredges. (Agency.) Shanghai, China. *3203.

Metal-spraying machines. (Purchase.) Jablonec, Czechoslovakia. *3200.

Printing machinery, especially off set two-tone machines. (Purchase and Agency.) Lyon, France. *3202.

Saws, cut-off, rip, cordwood, and other. (Agency.) Lima, Peru, *3199.

Weaving looms, hand-operated. (Purchase.) Medellin, Colombia. *3201.

PATENTS

May 11, 1937

Metal-Working Machinery

Hydraulic Step Drilling Unit. Harry F. Vickers and Kenneth R. Herman, Detroit, Mich., assigned to Vickers, Inc., Detroit, Mich. Patent 2,079,640.

Machine for Milling Turbine Blades. Erwin G. Roehm and Walter D. Archea, Norwood, Ohio, assigned to The Cincinnati Milling Machine Co., Cincinnati. Patent 2,079,717.

Hob Grinding Machine. Ervin L. Ackley, Worcester, Mass., assigned to John Bath & Co., Worcester. Patent 2,079,785.

Extrusion Apparatus. John H. Friden, East Orange, N. J., assigned to The Sun Tube Corp., Hillside, N. J. Patent 2,079,905.

Welding Apparatus. George E. Mirfield, Youngstown, Ohio, assigned to Direct Current Welding Co., Delaware. Patent 2,079,916.

Die-Casting Machine. Hans Gastrow, Zerbst in Anhalt, Germany, assigned to Firma Franz Braun Akt.-Ges., Zerbst in Anhalt. Patent 2,079,936.

Turning and Facing Machine. George F. Yager and Oliver J. Heath, Toledo, Ohio, assigned to The Bunting Brass and Bronze Co., Toledo. Patent 2,080,157.

Metal-Working Machine (Oil-Groove Cutter). George F. Yager and Oliver J. Heath, Toledo, Ohio, assigned to The Bunting Brass & Bronze Co., Toledo. Patent 2,080,158.

Lathe. Franz Emil Oskar Hoppe, Rorschacherberg, Switzerland. Patent 3,080,207.

Parts and Mechanisms

Electrical Chucking Mechanism for Multiple Spindle Automatic Chucking Machines. Charlie W. Simpson, Cleveland, assigned to National Acme Co., Cleveland. Patent 2,079,637.

Machine Tool Organization (for Lubrication). Walter D. Archea, Norwood, Ohio, assigned to The Cincinnati Milling Machine Co., Cincinnati. Patent 2,079,700.

Tracer for Hydraulically Operated Die-Sinking Machines. Robert D. Shaw, Hartford, Conn., assigned to Niles-Bement-Pond Co., New York. Patent 2,079,720.

Automatic Minimum Pressure Control for Operating Machinery (Hydraulic Press). Walter Ernst Mount, Mount Gilead, Ohio, assigned to The Hydraulic Press Corp., Inc., Wilmington, Del. Patent 2,079,904.

Automatic Welding Head. Lynn S. Burgett, Euclid, Ohio, assigned to Una Welding, Inc., East Cleveland, Ohio. Patent 2,079,956.

Grinding Apparatus (Control for). Engelbert Mühlbacher, Los Angeles, Calif. Patent 2,080,089.

Variable Speed Drive (for Machine Tools). Albrecht Mauer, Bad Homburg vor der Hohe, Germany, assigned to Link-Belt Co., Chicago. Patent 2,080,145.

Work Rotating Structure for Machine Tools. Henry C. Pierle, Cincinnati, assigned to The R. K. LeBlond Machine Tool Co., Cincinnati. Patent 2,080,228.

Anode for Electroplating by Hand. Max Schlötter, Berlin, Germany. Patent 2,080,234.

Processes

Method and Device for Locating and Machining Parts of Apparatus. Hal L. Cook, Cleveland Heights, Ohio, assigned to The Warner & Swasey Co., Cleveland. Patent 2,079,791.

Tools and Accessories

Broach Shank Connector. Francis J. Lapointe, Ann Arbor, Mich. Patent 2,079,692.

Combined Pliers and Screw Driver. Andrew G. Koon, Redlands, Calif. Patent 2,079,863.

Turning, Facing and Threading Tool. William W. Vosper, Toledo, Ohio, assigned to The Toledo Pipe Threading Machine Co., Toledo. Patent 2,079,954.

Spray Nozzle (for Grinding Wheel). Harold Holmboe, Chicago. Patent 2,080,206.

May 18, 1937

Metal-Working Machinery

Multiple Spindle Boring Machine. Fritz Walther, Plauen in Vogtland, Germany, assigned to Vomag-Betriebs-A. G., Plauen in Vogtland. Patent 2,080,643.

Lathe. Walter Möbius, Magdeburg, Germany. Patent 2,080,830.

Dovetail Milling Machine. Otto Drapak, Arnost Drapak, and Jindrich Drapak, Rochlitz, near Reichenberg, Czechoslovakia. Patent 2,080,859.

Metalworking Machine (Pipe Cutter). John Huber, Los Angeles. Assigned to United Concrete Pipe Corp., Los Angeles. Patent 2,080,889.

Balancing Machine. John Leonard Taylor,, Milwaukee. Patent 2,080,939.

Cutting Machine (Centerless Boring). Philip H. Hutchinson, Montclair, N. J., assigned to General Motors Corp., Detroit. Patent 2,080,941.

Hydraulically Operated Surface Grinding Machine. Wallace H. Wood, Worcester, Mass., assigned to Norton Co., Worcester, Mass. Patent 2,080,976.

Apparatus for Forming Tubular Articles. Clarence J. Keller, Anderson, Ind., assigned to General Motors Corp., Detroit. Patent 2,081,038.

Drill Press. Enoch W. Worden, Flint, Mich. Patent 2,081,079.

Parts and Mechanisms

Apparatus for Gas-Cutting and Welding of Metals. Lorn Campbell, Jr., Lakewood, Ohio. Patent 2,080,396.

Gear Cutter. August C. Heard, Rochester, N. Y., assigned to Gleason Works, Rochester. Patent 2,080,401.

Gauging Device. Yves A. Bouget, West Orange, N. J., assigned to Western Electric Co., Inc., New York. Patent 2,080,456.

Metal Cutting Machine. Theodore H. Doan, Shaker Heights, Ohio, assigned to The Foote-Burt Co., Cleveland. Patent 2,080,464.

Drill Grinding Apparatus. Herbert E. Tautz, Milwaukee. Patent 2,080,515.

Perforating Die. Arthur W. Altvater, University City, Mo. Patent 2,080,995.

Processes

Process of and Apparatus for Electroplating Articles. Franklin B. Rinck, La Grange, and Ray C. Kivley, Oak Park, Ill., assigned to Western Electric Co., Inc., New York. Patent 2,080,506.

Manufacture of Nuts. Lee A. Frayer, Kent, Ohio, assigned to The Lamson & Sessions Co., Cleveland. Patent 2,080,850.

Tools and Accessories

Power Grease Gun. Neil V. Smith and Carl W. Stoll, Los Angeles, assigned to Smith-Johnson Corp., Los Angeles. Patent 2,080,513.

Micrometer Caliper. Philip J. Darlington, Cambridge, Mass., assigned to Robert G. Morse, Marblehead, Mass. Patent 2,080,534.

Arrangement for Fixation of the Edges of a Joint to be Welded. Sven August Eskilson, Stockholm, Anders Rudolf Gunnert, Lidingo, and Knut Gustaf Ernfrid Hubinette, Stockholm, Sweden, assigned to American Gas Accumulator Co., Elizabeth, N. J. Patent 2,080,563.

Rotary Tool. Lloyd G. Speth, Claridon, Ohio, assigned to The Cleveland Pneumatic Tool Co., Cleveland. Patent 2,080,973.

Wheel Wear in Cutter Grinding

FRANCIS W. SHAW
Broadley, Lancashire, England

THE METHOD suggested in the article under the above title (*AM*—Vol. 81, page 195) presupposes that every face-milling cutter has a multiple of four teeth, otherwise it would be impossible to group the teeth into four equal sections, opposite sections of which are ground in turn.

The best way to maintain evenness of grinding, that is to minimize the influence of wheel wear, is by stepping around the cutter in such a way that nearly opposite teeth are ground successively. Thus, in a 16-tooth cutter the grinding would be in either of the two following orders:

1	8	15	6	13	4	11	2
9	16	7	14	5	12	3	10

1	10	3	12	5	14	7	16
9	2	11	4	13	6	15	8

In the former the stepping around is by seven teeth at a time; in the latter by nine teeth, one less or one more than half the total.

If the rough grinding is done at a similar stepping around, the final grinding is likely to be the more accurate, too.

The method here suggested is analagous to the "block indexing" that is followed with advantage in gear cutting and grinding. To the writer it seems extraordinary that the principle is not nearly universally employed, since it distributes the effect not merely of wheel or cutter wear, but of distortion due to unequal heating of the cutter or the gear blank.

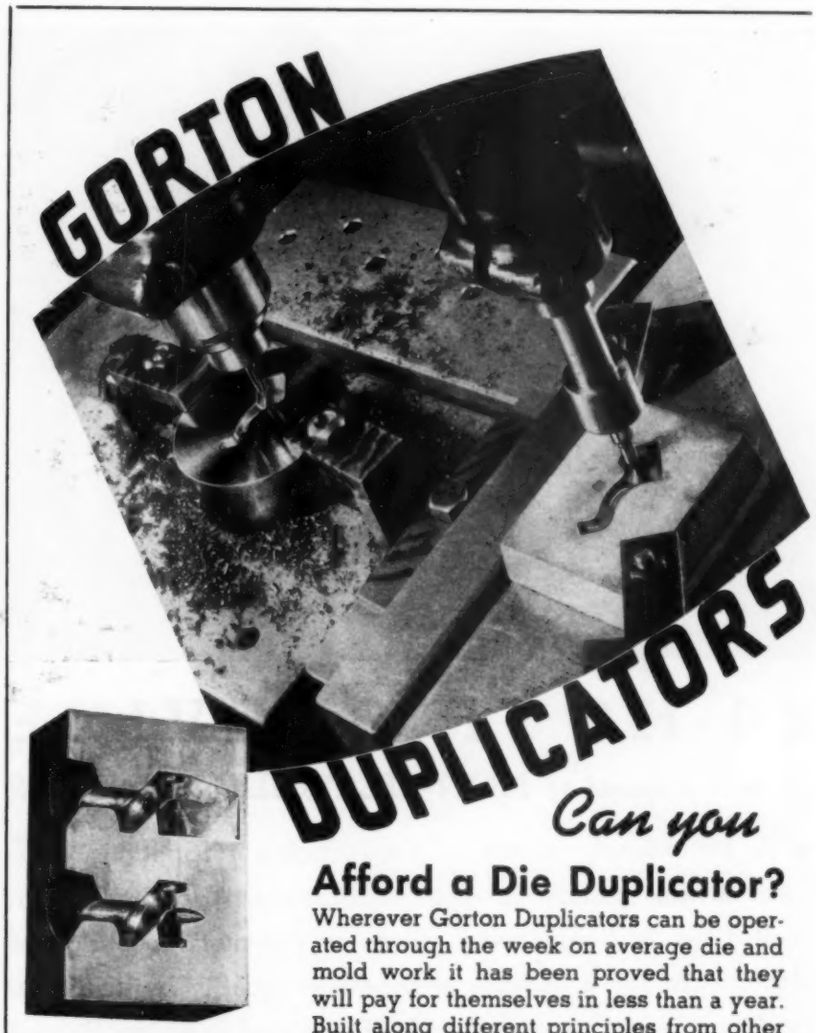
Toolbox Training

CHARLES WESLOW

ONE OF THE best traits in an apprentice is for him to show his tools and other trinklets he has in his tool box to another apprentice. They seldom show their tools to a journeyman, for fear of criticism. And few journeymen show their tools to an apprentice. I often wonder why.

Last year a photo of my tool-box and what's in it was published in this magazine for every apprentice in the world to observe. Apprentice boys can always see illustrations of tools in manufacturers catalogs, but they prefer to see the actual tools various men get along with. They know what the boss has got. They see his tools spread out everywhere if they are not in the crib, but they yearn to see and compare the workman's tools and have no idea of criticism either. The tools a man has in his box to work with are second nature to him, and boys should not be deprived of the opportunity to visualize such relics, although some of them may be modern.

One noon hour, I was showing an apprentice what I had in my box and bag, and before long all the six apprentices were horning in for an eyeful. Proud is the mother who finds her boy saving up to buy a micrometer, which after all is the fundamental tool in our trade, and eventually leads to the boy's having an independent trade to work at in his mature years instead of fishing around at unskilled labor all his life. I always willingly show the boys what I have in my box, but I hate to show any of the men, because when they want something they haven't got, they know who has it.



Example No. 1395
Auger bit forging die. Reproduced from an original die on 8½-D Duplicator, complete in 2¼ hours. Accuracy limits — .002". Cutters used — Gorton single flute Momax in 5 sizes from ⅜" down to .025" dia.

Can you

Afford a Die Duplicator?

Wherever Gorton Duplicators can be operated through the week on average die and mold work it has been proved that they will pay for themselves in less than a year. Built along different principles from other machines reproducing dies and molds, they cost less and require practically no maintenance. The cutters, tracing styles, etc., needed are bought or made by the user at low cost.

A small forging die is set up here on the 8-D. Cut in alloy steel from stone composition model in 1½ hours to within .005",

GEORGE GORTON MACHINE CO.
1103 13TH ST. RACINE, WIS.

Would Profits Increase Wages?

W. J. CAMERON

HENRY FORD began business in a little shop with 75 men. Himself a working man with progressive ideas of workingmen's rights, he intended to build into his business, as soon as he could, certain basic improvements in industrial relations.

But with all his progressiveness, common sense told him he could not level his business every Saturday night and start from scratch again every Monday morning. Anyone can see what would have happened had he called his men together every week and divided amongst them the week's profit.

What would have been left for experiment, equipment, improvement, growth? Nothing. The little shop would have stayed little. Its crude methods would have remained crude. The little Ford shop, dispersing its profits, would have drifted farther and farther behind, grown more and more antiquated, until eventually it disappeared. The 75 workmen could not have grown into the 125,000 men we see today. For profits are what a business grows on. Profits support a business in the same way that wages support a family.

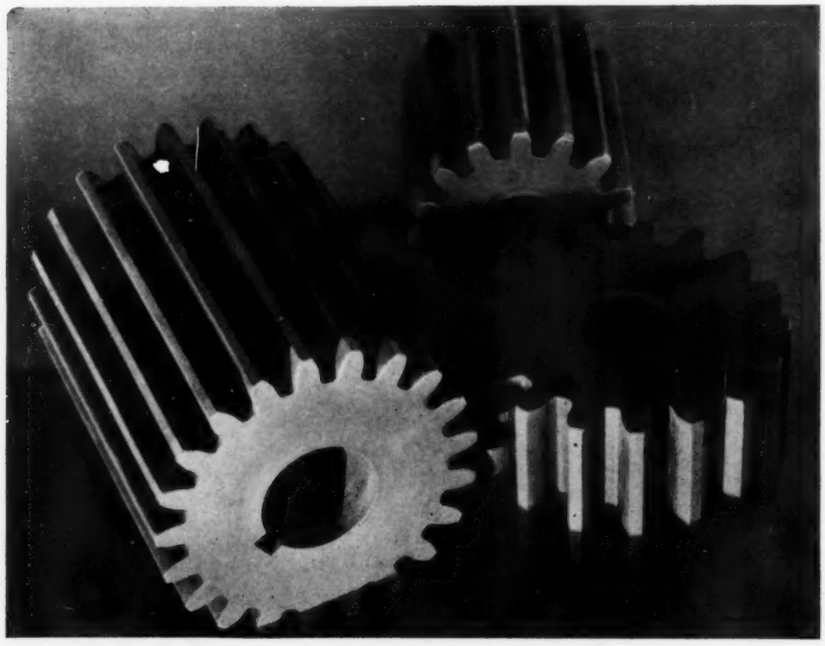
Ford profits during the last 33 years mounted to $844,000,000. Conserved and invested in the business these profits did much more for the employees than if they had been divided among them. They produced in wages four times as much as all the profits amounted to; they supplied the nation with 25 million useful vehicles; they increased those original 75 Ford jobs to 125,000 Ford jobs, and made possible 200,000 other jobs in outside industries; and they supported government with 600 million dollars in taxes.

The profits are imbedded in land, buildings, furnaces, machines— hundreds of millions of which have been used up and have disappeared. Had profits been dissipated or distributed either to labor or capital, these tools of productive and well paid employment would simply not have existed.

If all the dividends had been given to the employees, how much additional would they have received? Dividends are the amounts taken out of profits for the owners' use. Much of the Ford dividends were paid out when the Company had stockholders whose principal connection with the Company was the drawing of dividends. We asked the auditors to find exactly the difference it would have made in Ford wages if all dividends paid out during those 33 years had been added to wages and paid exclusively to employees. And this is what we find: it would have meant a wage increase for each man of less than six cents a working hour. Less than six cents an hour for each man! Had the dividends of the last ten years been added to wages, the increase would have dropped to about three cents an hour. These amounts are not very exciting when we consider that the actual increase in Ford wages during the 33 years was about 400 per cent.

The philosophy of "taking everything" whether practiced by management or labor, or by both together, or by government tax collectors, results in nobody's getting anything. That is natural law. Wealth must circulate.

Abstracted from a talk given on the Ford Sunday Evening Hour, April 4, 1937, over the Columbia Broadcasting System.



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on many types of NON-METALLIC PINIONS

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Progress in Rate Setting

GAYLORD G. THOMPSON

In the early days of rate-setting, rates were determined from past-performance records. Later, the "rate-setter" put in his appearance. He had a stop watch, but it was hid in his pocket where it was manipulated while he was concealed behind a post or located some distance away from the operation he was timing. This was done so as not to arouse the suspicions of the worker.

When rate-setting ceased to be a source of secret calculations, capable observers making time and motion studies had very little trouble overcoming any opposition of workers to established rates, because the methods of calculation were simple enough for the workers to understand when their cooperation was asked. They had confidence in the observer and the methods he was using. The observer was a trained man in the fundamentals of the operation being studied and he was usually diplomatic enough to sell the idea of time study to the workers in order to get their good will.

In late years there has been a tendency to change the style of time and motion study into something full of frills and flounces. Time and motion study was made a thing of mysticism.

One large manufacturing concern operated for years with a simple time-study system. Operation sheets, coving each part manufactured, were written as fast as new designs were made. Time and motion studies were being compiled continually and rates were established for each operation. There were no intricate calculations of rates to befuddle the worker, either in the shop or the office. There was harmony and understanding.

This efficient system was upset when a staff of new efficiency men made their appearance. They brought with them a maze of charts and curves; a conglamoration of graphics was introduced that bewildered the existing office force. Study classes had to be conducted to familiarize them with the new system. Time study forms were changed, made more intricate and elaborate. When an operation was studied and elapsed time noted, the rate could not be set without reference to some chart. The observer had to use his own judgment as to which combination of figures on the chart would be most suitable for the operation studied before setting the rate.

Why beat around the bush? The observer could have used his own judgment under the old method, and arrived at as accurate results with much less cost and loss of time to all concerned.

The power of time study to boost production is limited. No system of intricate mathematical calculations is going to perform miracles in extending the limitations of men and machinery. When the plant started to curtail operations, the time study department was the first to be eliminated.

Making a Safety Program Effective

An adequate program of industrial safety cannot be established and successfully maintained without a comprehensive study of company policies, practices, equipment and personnel, and a subsequent adjustment of such factors to conform to desirable standards.

In many cases safety programs have failed to function effectively be-

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cause company policies (1) were so limited in scope as to be quite inadequate and too often have been treated as matters of expediency, (2) were confusing to line or staff officers because delegated authority and responsibility were not defined and allocated, and (3) were seldom properly transmitted to all employees in well-written, easily understood language.

In developing safety, a plant can build one of the most satisfactory organizations and programs or, through lack of intelligent cooperation or actual opposition, reduce the effectiveness of safety work to a point where employees will disregard all rules and ridicule the spasmodic efforts of the management.

When employees are permitted or encouraged to avoid the use of protective devices, even on jobs when the hazard is slight, they probably will take the next step and encroach in this field until a major accident occurs.

Further, good management-employee relations help locate and eliminate hazards before men or equipment are damaged. Proper coordination of effort will cause all employees to be so conscious of the need for safety that they will refuse to operate machines or processes when improperly guarded.

Regular and rigorous re-examination of equipment and guarding will provide reports of hazards that in most cases can be eliminated by mechanical treatment. In many cases these reports can be reinforced by periodic analyses of reports on plant experience, including workmen's compensation cases and other shop cases classified as to the type, cause, point of occurrence, severity, loss of time, and recurrence.

Management should take the initiative in promoting these studies and not depend entirely upon the reports of inspectors for insurance carriers or state factory inspectors.

Fear Factors No Remedy

Most accident prevention programs in use in industry, though effective in certain cases, have attacked accidents by using fear factors to overcome, in part, the failure of supervisory officials to instruct workmen properly in the control of tools or processes. Perhaps we will never be able to eliminate fear factors, but their use may be reduced by giving each employee thorough instruction and adequate supervision.

The most effective fundamental means of control in industrial accidents is education in the use of tools or processes so employees will do the right thing in the right way at the right time. This educational program should include foremen, journeymen, specialists, and apprentices. It should be designed to meet their needs, based on the best standards of performance determined by practice or engineers to obtain maximum production with a minimum expenditure of energy and the maximum of hazard reduction.

Correct instruction should not only eliminate hazards and reduce accidents, but also eliminate much spoiled work and increase production.

Management could very profitably expand its apprentice training programs. The apprentice groups of today will provide future journeymen and specialists. Industry must develop these or accept lower standards of performance in the future.

—

Abstracted from paper presented before the 1936 National Safety Congress by J. F. Kolb, Director, Department of Industrial Relations, National Metal Trades Association.

DID you ever walk on, . . . or rather try to walk on an oil or grease spotted floor or one that had retained a soapy surface film as a result of cleaning? Then you know how slippery it is . . . and how dangerous!

Needless Hazard

Here is a hazard no plant need put up with any longer. Washing with the correct Oakite solution is all that is needed. Efficient Oakite cleaning action quickly loosens dirt, oil and grease, so they rinse away completely. Wood, tile, terrazzo, concrete, and rubber surfaces are left spotless and FILM-FREE.

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TRADE PUBLICATIONS

AIR COMPRESSORS. Bulletin L-621-B5, offered by Worthington Pump & Machinery Corp., Harrison, N. J., is a condensed catalog of vertical, single-cylinder, single-stage compressors.

AIR CONDITIONING. Westinghouse Electric & Mfg. Co., 200 East Fifth St., Mansfield, Ohio, is mailing new data sheets for the "Air Conditioning Engineering Data Book."

AUTOMATIC LATHES. Cone Automatic Machine Co., Inc., Windsor, Vt., is offering bulletins describing the four- and eight-spindle Conomatics and the four-spindle Cone automatic lathes.

AUTOMATIC TIMERS. Automatic Temperature Control Co., Inc., 34 East Logan St., Philadelphia, Pa., has announced publication of Bulletin G-14. This bulletin shows types of automatic timers involving the design of special equipment.

BALL BEARINGS. New Departure Division, General Motors Corp., Bristol, Conn., has released Booklet S, which is to serve as the 1937 standard catalog on ball bearings. This 146-page catalog lists available types, sizes and list prices.

BELT CONVEYORS. Catalog No. 270, offered by Chain Belt Co., 1600 West Bruce St., Milwaukee, Wis., is a 114-page booklet giving engineering data and cataloging standard equipment.

BLUE PRINTER. Paragon-Revolute Corp., 77 South Ave., Rochester, N. Y., is offering a 19-page catalog describing the No. 3H blue-printing machine. This machine is available for two paper widths and has operating speeds up to 20 ft. per min.

CAMS. Banner Mfg. Co., 1873 Clybourn Ave., Chicago, has published a folder describing the one-day service on cam cutting and listing prices for various sizes of cams.

CARBON-DIOXIDE METERS. Catalog No. 3005, recently published by the Brown Instrument Co., Wayne & Robert Aves., Philadelphia, describes indicating and recording carbon-dioxide meters as well as combined carbon-dioxide and flue-gas temperature recorders.

CARD SYSTEMS. The "Buried Treasure" check-list offered by Acme Card System Co., 8 S. Michigan Ave., Chicago, gives department heads a means of determining the efficiency of record-keeping equipment.

COLLOIDAL GRAPHITE. Technical Bulletin No. 270.1, published by Acheson Colloids Corp., Port Huron, Mich., discusses the utility of graphite surfaces.

DECORATIVE FINISHES. Hilo Varnish Corp., 42-60 Stewart Ave., Brooklyn, N. Y., has announced publication of the third edition of Methods Bulletin M-A, which provides helpful information regarding the proper storing, mixing and reducing of decorative protective coatings.

DIESEL ENGINES. The Model 42-E heavy-duty diesel for the small power user is described in a folder published by Fairbanks-Morse & Co., 900 S. Wabash Ave., Chicago.

DISK-BRAKE MOTORS. Reliance disk-brake motors are described in Bulletin No. 305, offered by Reliance Electric & Engineering Co., Ivanhoe Road, Cleveland, Ohio. These combined units are for power applications requiring quick stops or the holding of a load.

DRILL CHART. A decimal equivalent and tap drill size chart, which is

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CHUCK
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Solid Taper Shank Perfectly Fits the Spindles for Absolute Accuracy
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covered with cellophane and can be cleaned without damage to the surface, has been issued by Whitman & Barnes, Detroit. Nominal and decimal dimensions of all standard drills 1-in. diameter and under are shown.

DUST COLLECTORS. Bulletin No. 79, offered by The C. O. Bartlett & Snow Co., Cleveland, describes the design and operation of dust-collecting equipment and contains more than eight pages of usable engineering data.

EMPLOYEE GRIEVANCES. Elliott Service Co., 219 E. 44th St., New York, has announced a new series of brief articles in "Management Information", a weekly bulletin for department heads and supervisors, that will provide a constructive program on how to handle grievances. These will be written by Glenn L. Gardiner.

EXPANSION JOINTS. Type "S" stainless-steel bellows expansion joints, announced at the New York Power Show last December, are described in Bulletin No. X-37-4, now being mailed by Foster Wheeler Corp., 165 Broadway, New York. These expansion joints are suitable for operating temperatures up to 750 F.

FLEXIBLE COUPLING. The new Francke fractional horsepower flexible coupling is described and illustrated in Bulletin No. 53, recently published by John Waldron Corp., New Brunswick, N. J.

FLEXIBLE TUBING. American seamless flexible metal tubing, available in a wide range of sizes, is described in Bulletin No. SS-3, offered by American Metal Hose Branch. The American Brass Co., P. O. Box 791, Waterbury, Conn. Illustrations show typical installations.

GRINDING WHEEL DATA. A 112-page booklet on grinding wheels and abrasives, with the title "Grinding Wheel Data Book," has been published by Abrasive Co., Division of Simonds Saw and Steel Co., Tacony and Fraley Sts., Philadelphia. In addition to information concerning the application of the modern grinding wheel, this booklet contains a complete grinding wheel selection table.

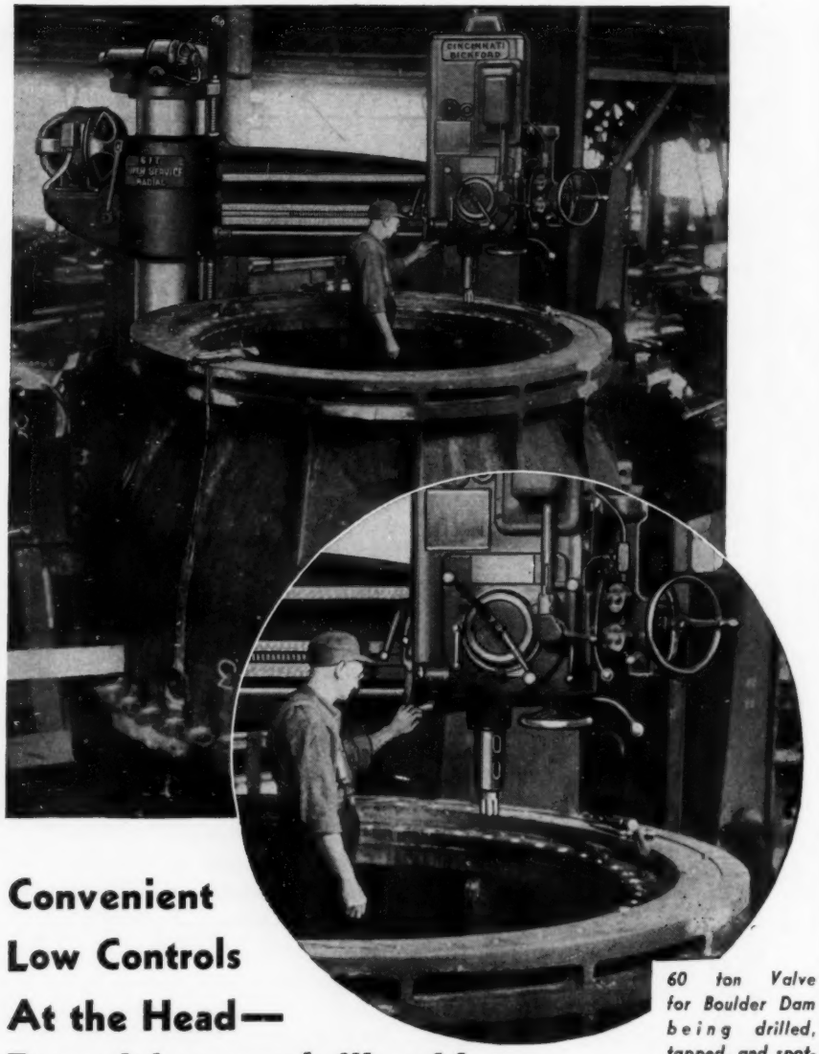
HEATING ELEMENTS. "Horizontal Gas-Fired Radiant Tube Heating Elements As Applied to Every Phase of Heat Treating" is the title of Form No. SC–80, now being mailed by Surface Combustion Corp., Toledo, Ohio.

HEAT-TREATMENT. The Brown Instrument Co., Wayne & Robert Aves., Philadelphia, has published folder No. 92-2 with the title "Standardizes Quality in the Heat-Treatment of Metals." This folder describes the advantages of using the "Analy-Graph" in heat-treating processes.

MACHINING DATA. Technical information on the machining of Monel, Nickel and Inconel metal is given in the 14-page Bulletin No. T-12, offered by the Development and Research Division of The International Nickel Co., Inc., 67 Wall St., New York.

MAINTENANCE MATERIALS. A catalog of materials for the maintenance of metal, concrete, wood, glass and composition surfaces has been published by The Skybryte Co., Cleveland, Ohio. A convenient application index is included.

METAL CLEANING. Booklet No. 211, published by the American Foundry Equipment Co., 555 Byrkit St., Mishawaka, Ind., gives information regarding the "Wheelabrator" Tum-Blast airless abrasive method of metal cleaning. New and improved models are illustrated and described.



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60 ton Valve for Boulder Dam being drilled, tapped, and spotfaced on the Super Service Radial at the Thomas Spacing Machine Company, Pittsburgh.

The Cincinnati Bickford Tool Co. Oakley, Cincinnati, Ohio

SUPER-SERVICE RADIALS

PIPE TOOLS. An 8-page bulletin describing the Model A portable pipe threading and cutting machine is offered by Beaver Pipe Tools, Inc., 375 Dana St., N. E., Warren, Ohio.

PORTABLE CRANE TRUCKS. Bulletin No. A-7992, published by the Elwell-Parker Electric Co., 4205 St. Clair Ave., Cleveland, Ohio, describes four types of portable crane trucks ranging in capacity from 1000 to 10,000 lb.

PRE-FINISHED METALS. American Nickeloid Co., Peru, Ill., is distributing a folder describing round-edge flat wire with a pre-finished surface.

PRESSURE AND VACUUM SWITCHES. Diaphragm-type pressure and vacuum switches for a.c. or d.c. service are described in Bulletin GEA-821F, offered by General Electric Co., Schenectady, N. Y.

PUMPS. Bulletins No. 5814F, No. 5870 and No. 6150, offered by Fairbanks, Morse and Co., 900 S. Wabash Ave., Chicago, describe centrifugal pumps and self-oiling power pumps.

PUMPS. Ingersoll-Rand Co., 11 Broadway, New York, has issued a catalog describing the Cameron Motorpumps. These pumps combine the electric motor and centrifugal pump in a single unit.

REAMERS. Bulletin No. 15-A, published by McCrosky Tool Corp., 1345-85 S. Main St., Meadville, Pa., lists and describes McCrosky-Super adjustable reamers. Instructions for adjusting and grinding these reamers is given.

ROLLER CHAIN. Catalog No. 607, published by the Diamond Chain & Mfg. Co., Indianapolis, is a 96-page book containing data and prices on standard roller chains and sprockets.

SPECTROMETRIC EQUIPMENT. A 24-page catalog, No. D-221, listing and describing various spectrometric equipment has been published by Bausch & Lomb Optical Co., Rochester, N. Y.

SPEED CONTROL. Reeves Pulley Co., Columbus, Ind., announces publication of a new edition of the "Speed Control Handbook." This 118-page handbook includes 60 illustrations of specific applications.

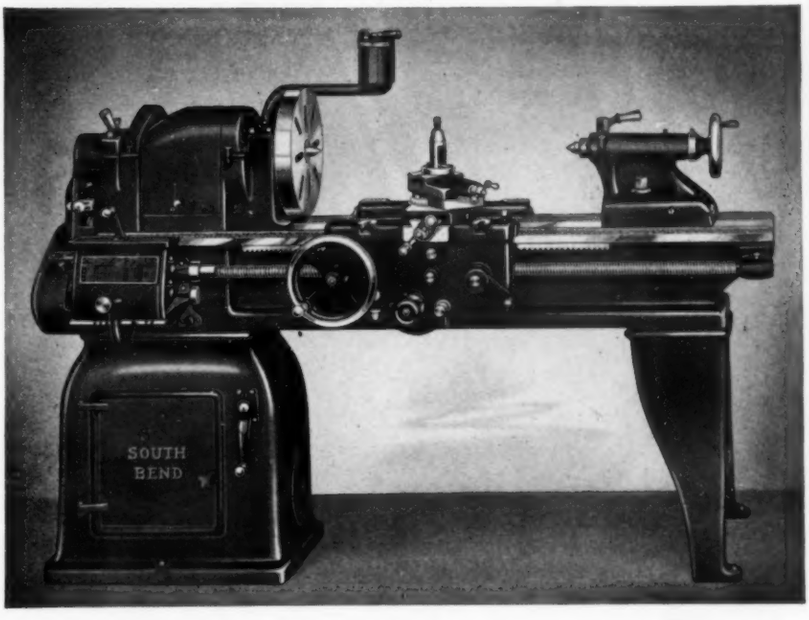
SPEED REDUCERS. Complete catalogs describing worm-gear speed reducers and "Limitorque" valve controls have been published by Philadelphia Gear Works, Erie Ave. and G. St., Philadelphia. A revised edition of the "MotoReduceR" catalog is available.

SQUIRREL-CAGE MOTORS. Descriptive Data Sheet No. 3105, published by Westinghouse Electric Mfg. Co., East Pittsburgh, Pa., describes Type CS squirrel-cage motors.

TIN RESEARCH. The corrosion of copper, lead and tin and the influence of these metals upon the deterioration of commercial lubricating motor-oils are discussed in "Research on Thin Layers of Tin and Other Metals—III" published as Technical Publication No. 51, by the International Tin Research and Development Council, 149 Broadway, New York.

VALVES. Quarter-turn valves and Hovalco blow-off valves are described in a 24-page catalog published by Homestead Valve Mfg. Co., Inc., Coraopolis, Pa.

WELDED CONSTRUCTION. "Modernized Metal Forming Machinery" is the title of a folder published by National Electrical Manufacturers Assn. Electric Welding Section, Frick Bldg., Pittsburgh, Pa. This folder discusses the design and construction of all welded press brakes.



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A. C. Colby Mchry. Co., 183 Centre St., New York, N. Y.
Reynolds Mchry. Co., 171 Pine St., Providence, R. I.
Lee Mchry. Co., 6318 E. Jefferson Blvd., Detroit, Mich.
Voell Mchry. Co., 1533 No. 16th St., Milwaukee, Wisc.
Colcord-Wright Mchry. Co., 1223 No. Brdwy. St. Louis.
Reynolds Mchry. Co., 2034 East 22nd St., Cleveland, O.
The MacKenzie Mchry. Co., 36 Oliver St., Boston, Mass.
W. B. Rapp Mchry., 132 No. Third St., Philadelphia, Pa.

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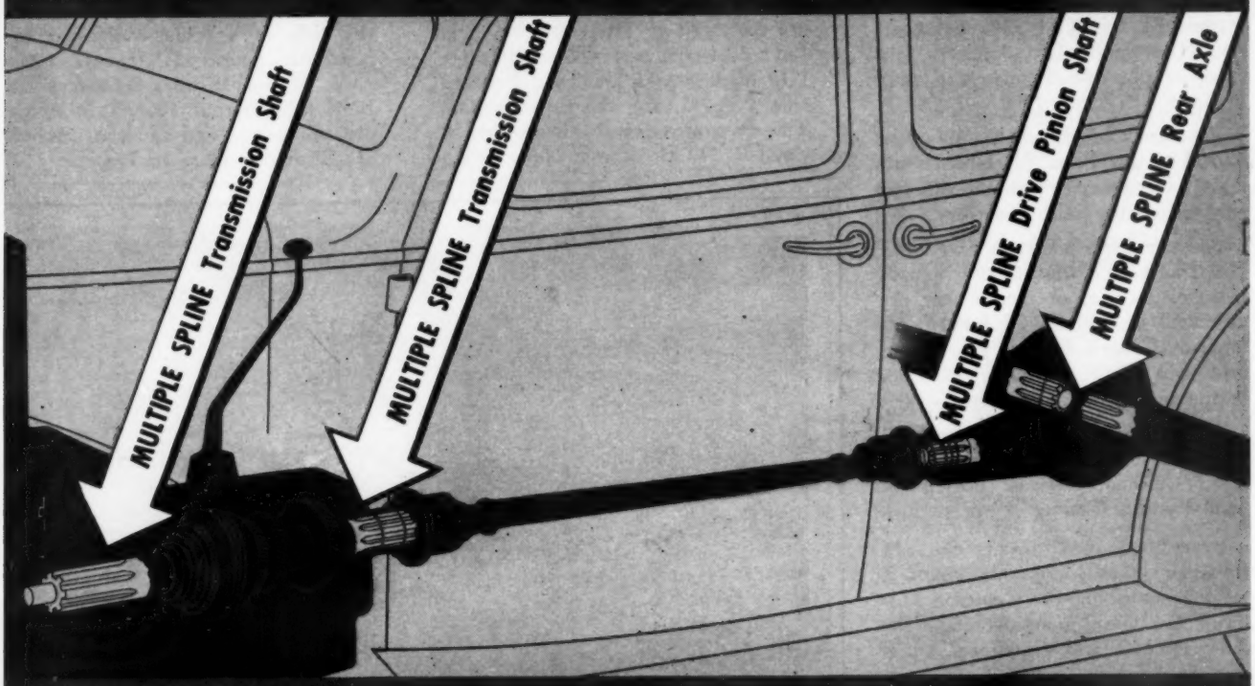
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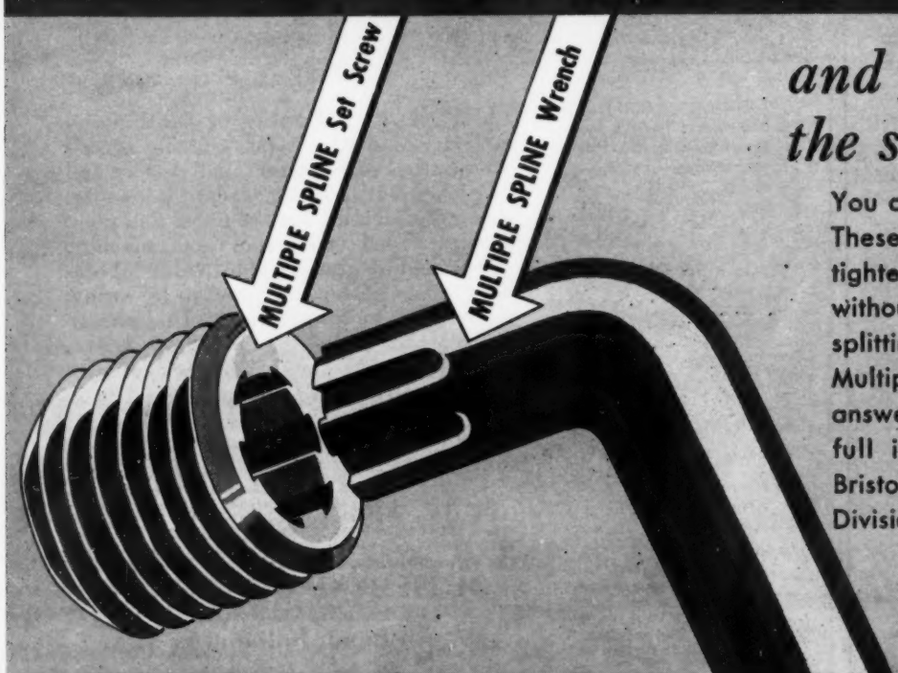

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